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 or for download online:

a. Standard Specifications for Highway Construction, 2017 Edition ($25.00). Available online at:

[www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs/sshc2017.pdf](http://www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs/sshc2017.pdf), or order bound book from LuLu at:

<https://www.lulu.com/en/us/shop/state-of-alaska-dept-of-transportation/2017-alaska-standards-specifications-for-highway-construction/paperback/product-1g2j7ymj.html>

b. Alaska Test Methods Manual (Lab & Field), May 30, 2020 Edition ($25.00). Available online at:

[www.dot.state.ak.us/stwddes/desmaterials/mat\_waqtc/testman.shtml](http://www.dot.state.ak.us/stwddes/desmaterials/mat_waqtc/testman.shtml)

c. Alaska Storm Water Pollution Prevention Plan Guide, March 2017.

[www.dot.state.ak.us/stwddes/desenviron/resources/stormwater.shtml](http://www.dot.state.ak.us/stwddes/desenviron/resources/stormwater.shtml)

d. Utility facility clearance requirements. Available online at:

• Homer Electric Association, Inc. (HEA) Electrical Safety Requirements

www.homerelectric.com/power-line-safety/

• ENSTAR Natural Gas Company (ENSTAR)

[www.enstarnaturalgas.com/safety-education/natural-gas-safety/safety-for-excavators-contractors/](http://www.enstarnaturalgas.com/safety-education/natural-gas-safety/safety-for-excavators-contractors/)

e. Quantity Computations

f. Cross Sections

g. Geotechnical Report: Homer Lake Street Rehabilitation, Project No. 0001422 / Z524610000, June, 2011, By DOT&PF

h. Geotechnical Report: Homer Lake Street Signal Poles, Project No. 0001422 / Z524610000, February, 2019, By DOT&PF

i. Erosion, Sediment Control Plan (ESCP): Homer Lake Street Rehabilitation, Project No. 0001422 / Z524610000, February, 2020, By Kuna Engineering

j. Traffic Control Plan (TCP): Homer Lake Street Rehabilitation, Project No. 0001422 / Z524610000, February, 2020, By Kuna Engineering

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 Department, in coordination with US DOT, has adopted a Race-Neutral DBE Program effective for Federal-aid projects advertised in Central Region after June 30, 2015. In particular, all bidders shall be aware that Good Faith Effort Documentation is required from the successful bidder for all contracts, regardless of DBE goal or DBE utilization, in accordance with Section 120 Disadvantaged Business Enterprise (DBE) Program.

The overall DBE Utilization Goal is revised to 8.83 percent.

Direct questions about this notice to the Manager of the Civil Rights Office, (907) 269-0848, <http://www.dot.state.ak.us/cvlrts/index.shtml>.

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 Act. On December 22, 2015, U.S. District Court for the District of Columbia issued a decision vacating the Federal Highway Administration (FHWA) 90 percent threshold exemption for manufactured steel and iron products and the miscellaneous steel or iron components, subcomponents and hardware waiver. As a result of the federal court decision, FHWA withdrew their December 21, 2012 policy memorandum clarifying provisions of the Buy America Act requirements.

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. 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.

9. COVID-19 Management Plan. In cooperation with the Associated General Contractors of Alaska, DOT&PF has developed a COVID-19 Management Plan that has been submitted to the Alaska Unified Command for utilization by DOT&PF contractors and consultants in compliance with the requirements of the Governor's Health Mandates. A copy of this plan may be downloaded at: <http://dot.alaska.gov/2020/docs/COVID-19-Mitigation-Response-Plan.pdf>

To comply with the Health Mandates, all DOT&PF contractors, subcontractors, and consultants must either adopt the DOT&PF COVID-19 Management Plan or develop their own plan that has been independently submitted to the Alaska Unified Command.

Consistent with Section 107-1.01 of the Standard Specifications for Highway Construction, the Contractor will be responsible for paying all costs and expenses incurred to comply with all COVID-19 Health Mandates in effect during times when the Contractor is performing project-related work activities. The Contractor will additionally be responsible for preparing all general or site-specific mitigation and response plans required for its forces, along with any attendant schedule delays or impacts. To the extent mitigation and response plans are required by a Health Mandate, those will be provided to the Engineer seven (7) days prior to mobilization.

10. 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(4).

11. 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.

12. Cross-Reference for Pay Item Numbers. Pay item numbers in the Bid Schedule are cross-referenced to the pay item numbers in all other contract documents. The cross-reference for pay item numbers is included in the Estimate of Quantities table on the plans.

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

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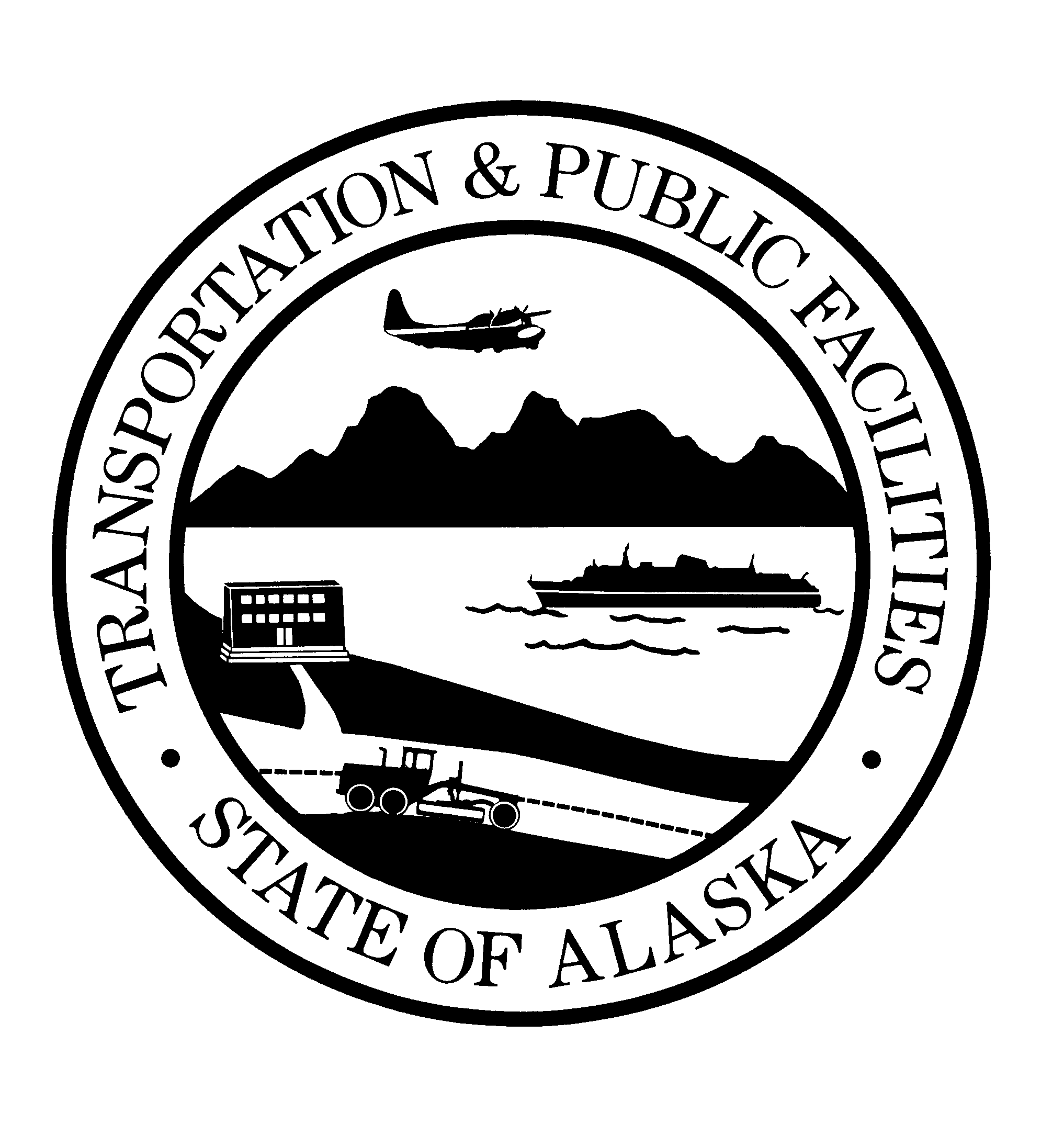
14. Asbestos Cement Pipe: See specification Section 202-3.04 Removal of Pipe for asbestos cement pipe removal requirements at location shown on the plans.

Z524610000

**PART 4**

STANDARD MODIFICATIONS  
AND  
SPECIAL PROVISIONS

To the **STATE OF ALASKA**



**STANDARD**

**SPECIFICATIONS**

**FOR**

**HIGHWAY CONSTRUCTION**

**2017**

**EDITION**

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DIVISION 100 — GENERAL PROVISIONS

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SECTION 101  
DEFINITIONS AND TERMS

Standard Modification

**101-1.01 GENERAL.**

Add the following paragraph after the sixth paragraph:

Delete "Standard Drawing" throughout the Alaska Standard Specifications for Highway Construction and throughout the Alaska Traffic Manual Supplement and replace in both documents with, "Alaska Standard Plan".

**101-1.03 DEFINITIONS.**

Add the following definition:

**ALASKA STANDARD PLAN.** Detail Drawing adopted by the Department for repetitive use, showing details to be used where appropriate.

Delete the following definition:

**STANDARD DRAWING.**

HSM18-4-020819

Delete the definition for BID and replace with the following:

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

Add the following five definitions:

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

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

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

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

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

HSM18-1.101-070118

SECTION 102  
BIDDING REQUIREMENTS AND CONDITIONS

Standard Modification

**102-1.05 PREPARATION OF BID.** Delete the subsection in its entirety and replace with the following:

A bidder shall prepare its bid using either the Department approved bid preparation software or the Department provided bid forms or legible copies of the Department’s forms. All entries shall be legible and in ink or type.

Bidders shall:

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

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

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

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

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

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

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

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

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

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

*“We wish to disqualify all of our successful bids at this bid opening which exceed the total of $\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_ contracts and hereby authorize the Department to determine which bids to disqualify, based on this limit.”*

**102-1.06 NONRESPONSIVE BIDS.** Delete the subsection in its entirety and replace with the following:

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

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

b. Contains unauthorized additions, conditional or alternative bids, or other irregularities that make the bid incomplete, indefinite, or ambiguous;

c. Includes a reservation of the right to accept or reject any award, or to enter into a contract pursuant to an award, except for an award limitation under Subsection 102-1.05;

d. Fails to include an acceptable bid guaranty with the bid;

e. Is materially unbalanced; or

f. Fails to meet any other material requirement of the Invitation To Bid.

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

a. Is not typed or completed in ink;

b. Fails to include an acknowledgement of receipt of each addendum by assigned number and date of issue; or

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

**102-1.07 BID GUARANTY.** Delete the subsection in its entirety and replace with the following:

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

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

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

**102-1.08 DELIVERY OF BIDS.** Delete the subsection in its entirety and replace with the following:

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

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

**102-1.09 WITHDRAWAL OR REVISION OF BIDS.** Delete the subsection in its entirety and replace with the following:

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

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

**102-1.11 ADDENDA REQUIREMENTS.** Delete the subsection in its entirety and replace with the following:

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

**102-1.12 RECEIPT AND OPENING OF BIDS.** Delete the subsection in its entirety and replace with the following:

The Department will only consider bids, revisions, and withdrawals received before the deadline stated in the Invitation to Bid.

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

Add the following subsection:

**102-1.14 ELECTRONIC MAIL** Within its submitted bid, a bidder must include a current electronic mail (email) address of bidder’s representative who possesses authority to receive, process, and respond to Department emails regarding the advertised project.

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

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

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

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

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

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

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

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

5. An attached copy of the subject email.

HSM18-1.102-070118

SECTION 103  
AWARD AND EXECUTION OF CONTRACT

Standard Modification

**103-1.01 CONSIDERATION OF BIDS.** Delete the subsection in its entirety and replace with the following:

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

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

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

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

**WHOLLY STATE-FUNDED PROJECTS.** On wholly state-funded projects, determination of the low bidder will include bidder preferences as required under AS 36.30.321, according to subsections 1-3 below. Alaska Bidder Preference, Alaska Veteran Preference, and Alaska Product Preference are not applicable on projects with federal funding.

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

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

a. holds a current Alaska business license;

b. submits a bid for goods, services, or construction under the name as appearing on the person's current Alaska business license;

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

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

e. If a joint venture, is composed entirely of ventures that qualify under (a) through (d), above.

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

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

a. sole proprietorship owned by an Alaska veteran;

b. partnership under AS 32.06 or AS 32.11 if a majority of the partners are Alaska veterans;

c. limited liability company organized under AS 10.50 if a majority of the members are Alaska veterans; or

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

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

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

An Alaska veteran is a resident of Alaska who:

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

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

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

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

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

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

**103-1.03 AWARD OF CONTRACT.** Delete the subsection in its entirety and replace with the following:

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

The Department will notify the successful bidder in writing of its intent to award the Contract and request that certain required documents, including the Contract Form, bonds, and insurance be submitted within the time specified. The successful bidder's refusal to sign the Contract and provide the requested documents within the time specified may result in cancellation of the notice of intent to award and forfeiture of the bid security.

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

HSM18-1.103-070118

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

CR105.5-012816R

**105-1.15 PROJECT COMPLETION.**

3rd paragraph 1st sentence, replace: "621-3.04" with "618-3.06 and 621-3.04"

CR105.7-042015

SECTION 106  
CONTROL OF MATERIAL

Special Provision

**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, as amended effective August 13, 2020, Federal Register, Vol. 85, No. 157,   
49506 – 49582, **Prohibition on certain telecommunication and video surveillance services or equipment.**

Contractor shall submit documentation acceptable to the Department certifying 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 shall further certify that it has complied with the requirements of 2 CFR 200.216, as amended effective August 13, 2020, Federal Register, Vol. 85, No. 157, 49506 – 49582 and that it will continue to do so throughout the term of the Contract.

CR106.2-081320R

SECTION 107  
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Special Provisions

Replace Subsection 107-1.02 Permits, Licenses, and Taxes with the following:

**107-1.02 PERMITS, LICENSES, AND TAXES.** The terms, conditions, and stipulations in permits obtained either by the Department or by the Contractor are made a part of this Contract. Permits obtained by the Department for this project are attached to these Specifications as appendices. Contact names and phone numbers for permits obtained by the Department are shown on the individual permits.

The Department will:

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

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

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

a. U.S. Army Corps of Engineers Section 404 Permit No. 14

The Contractor shall:

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

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

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

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

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

6. Obtain modifications to permits acquired by the Contractor;

7. Pay all charges, fees and taxes;

8. Provide proof of payment of all taxes before the Department makes final payment; and

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

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.

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

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

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

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

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

4. Provide all of the following to the Engineer:

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

b. A written statement that all permits or clearances necessary have been obtained;

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

d. A plan that identifies how the site will be finally stabilized and protected.

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

CR107.2-120117.SSHC2017

**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.

CR107.3-051517

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.

CR107.1-100118

SECTION 108  
 PROSECUTION AND PROGRESS

Special Provisions

Add the following Subsection 108-1.011 Related Sections:

**108-1.011 RELATED SECTIONS.**

Section 652, Prosecution and Progress – Supplemental Requirements

CR108.3-012816R

Standard Modification

**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 | 500,000 | $1,000 |
| 500,000 | 1,000,000 | 1,500 |
| 1,000,000 | 5,000,000 | 1,800 |
| 5,000,000 | 10,000,000 | 2,500 |
| 10,000,000 | 25,000,000 | 3,800 |
| 25,000,000 | --------- | 4,800 |

CR\_HSM20-1-041420

SECTION 109  
MEASUREMENT AND PAYMENT

Standard Modification

**109-1.01 GENERAL.** Insert the following after the second paragraph:

Pay item numbers in the Bid Schedule are cross-referenced to the pay item numbers in all other contract documents. The cross-reference for pay item numbers is included in the Estimate of Quantities table on the plans.

HSM18-1.109-070118

Special Provisions

**109-1.02 MEASUREMENT OF QUANTITIES.** Replace item, "14. Weighing Procedures" with "Weighing Procedures". "Weighing Procedures" is a subtopic under item "13. Ton (2,000 pounds)."

CR109.3-042015

**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 Equipment Watch rate sheet for each piece of equipment utilized on time and materials work.

CR109.2-110118

SECTION 120  
DISADVANTAGED BUSINESS eNTERPRISE (DBE) PROGRAM

Special Provisions

**120-1.01 DESCRIPTION.**

Delete the second paragraph of Subsection 120-1.01 and replace with the following:

The Department, in coordination with the Federal Highway Administration (FHWA), adopted a Race-Neutral DBE Program with an overall DBE Utilization Goal of 8.83 percent for Alaska’s FHWA Federal-Aid program. Although the Race-Neutral program does not establish or require individual project DBE Utilization Goals, 49 CFR establishes the Bidder is responsible to make a portion of the work available to DBEs and to select those portions of the work or material needs consistent with the available DBEs to facilitate DBE participation.

SM3-122217.SSHC2017

DIVISION 200 — EARTHWORK

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SECTION 201  
CLEARING AND GRUBBING

Special Provisions

**201-3.01 GENERAL.** 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.

CR201.3-042313

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.

CR201.1-010114

**201-5.01 BASIS OF PAYMENT.** Add the following:

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

CR201.3-042313

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.

CR202.6-040120

**Gas Pipe**: remove and dispose.

CR202.5-040120

**202-3.01 GENERAL.** 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.

CR202.6-040120

**Fire Department Connection (FDC) Vault**. Coordinate with City of Homer to remove FDC vault and associated appurtenances. See section 627 for coordination requirements.

Z524610000

**202-3.04 REMOVAL OF PIPE.** Add the following:

**Gas Pipe**: ENSTAR Natural Gas Company will abandon existing gas pipelines. Follow the procedures given in Subsection 105-1.06 Cooperation With Utilities, when working around gas pipelines until they have been abandoned. Once the pipelines are abandoned, remove abandoned natural gas pipe within the right-of-way that are in conflict with the work and dispose of outside the right-of-way project limits according to Subsection 202-3.06.

CR202.5-040120

**Water and Sewer Pipe**:

Decommissioning of water and sewer pipes will require the Contractor to excavate, expose, and remove or salvage different parts, pieces, and assemblies of the water or sewer system. Salvage parts are to be identified by a City of Homer (COH) representative.

The Contractor is to restore the area of work to the preconstruction conditions or to final configuration shown by the plans. The Contractor is to provide written notice to the Engineer forty-eight (48) hours prior to beginning decommissioning work.

Decommission of water or sewer pipe by abandonment in place, usually starts on the downhill end of the pipe and requires the following:

1. Emptying the line.
2. Placing a one foot (1’) thick concrete plug with a vent tube at the higher end of the line.
3. Filling the pipe with a quantity of sand slurry or grout mixture equal to the total calculated volume from the newly installed plug to the point of injection.
4. Placing a one foot (1’) thick concrete plug at the injection end of the pipe.

In the event that the water or sewer pipe to be abandoned is cracked or crushed, the Contractor shall excavate to the next joint of pipe and install the plug. Crushed pipe sections unable to be abandoned shall be removed and disposed of by the Contractor.

Decommission of water or sewer pipe by removal, the Contractor is to excavate down to, remove, and dispose of the pipe.

The existing sewer system contains asbestos cement pipe. Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) oversee the working conditions for U.S. workers by implementing and managing occupational safety and health standards. The following regulations pertain to handling asbestos in the workplace.

29 CFR 1910.1001 Asbestos General Standard - Specification of permissible exposure limits, engineering controls, worker training, labeling, respiratory protection, and disposal of asbestos waste.

29 CFR 1926.1101 Asbestos Construction Standards - Covers construction work involving asbestos, including work practices during demolition and renovation, worker training, disposal of asbestos waste, and specification of permissible exposure limits.

40 CFR Part 61, Subpart M 61.145 Standard for demolition and renovation.

40 CFR Part 61, Subpart M 61.150 Standard for waste disposal for manufacturing, fabricating, demolition, renovation, and spraying operations.

Z524610000

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.

CR202.2-040120

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.

CR202.1-040120

**202-5.01 BASIS OF PAYMENT.** Add the following:

Acquiring waste disposal permits is subsidiary to 202 Pay Items.

CR202.1-040120

Removal of abandoned gas pipe will not be paid for directly, but is subsidiary to Pay Item 203(3) Unclassified Excavation.

Item 202(14). At the Contract Unit price for the actual length of water conduit removed and disposed regardless of type or size. Excavation and backfill will be paid for under section 204.

Item 202(15). At the Contract Unit price for the actual length of water or sewer conduit abandoned in place regardless of type, separated by size of pipe. Excavation and backfill will be paid for under section 204.

No additional payment will be made to meet the regulations stated in Subsection 202-3.04 for decommission of sewer pipe by removal.

**Fire Department Connection (FDC) Vault**. Removal of vault, associated appurtenances, and coordination with City of Homer will be paid for under Pay Item 202(1).

Z524610000

Item 202(13). 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.

Pay Item No. Pay Item Pay Unit

202(13) Removal of Fence Linear Foot

202(14) Removal of Pipe, Water Conduit Linear Foot

202(15) Abandon Pipe in Place, \_\_\_\_\_ Conduit, \_\_ Inch Linear Foot

CR202.6R/Z524610000

SECTION 203  
EXCAVATION AND EMBANKMENT

Special Provisions

**203-1.01 DESCRIPTION.** Add the following:

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.

CR203.2/Z524610000

Add the following:

**203-3.01 GENERAL.** Add No. 5 after the 11th paragraph:

5. within 50 feet of detection loops.

CR203.4-022015

**203-5.01 BASIS OF PAYMENT.** Add the following:

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(3) Unclassified Excavation.

Obliteration of Roadway is subsidiary to Pay Item 202(2) Removal of Pavement.

Z524610000

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: Selected Material Type A.

Maximum Particle Size:

a. Corrugated Steel and Aluminum Conduit: material passing the 3-inch sieve

b. Precast Concrete Structures

(1) Conduit: materials passing the 1-inch sieve, except 2-inch when bedding thickness is greater than 6 inches

(2) Minor structures: material passing the 1-inch sieve

c. Plastic Conduit: material passing the 2-inch sieve, except 3/4-inch for conduit between 8 inches and 15 inches and for conduit less than 8 inches 10% of the conduit diameter

d. Electrical Conduit: material passing the 1-inch sieve

e. Underdrain Conduit: uniform porous backfill material passing the 2-inch sieve and a minimum greater than the conduit perforations

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.

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

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

When item 204(1), 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.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

204(1) Structure Excavation Cubic Yard

CR204-061520

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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:

|  |  |
| --- | --- |
| **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.

CR301.1-012407

**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.

CR301.2-062116

Add No. 5 after the 5th paragraph:

5. within 50 feet of detector loops.

CR301.3-022015

**301-3.03 SHAPING AND COMPACTION.** 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(1) Aggregate Base Course, at the unit price shown in the bid schedule for that Item.

CR301.1-012407

Special Provision

Replace Section 306 with the following:

SECTION 306  
ASPHALT TREATED BASE COURSE

**306-1.01 DESCRIPTION.** Construct a plant-mixed asphalt treated base (ATB) course on an approved foundation to the lines, grades, and depths shown in the Plans. Recycled asphalt pavement (RAP) may be used in the mix as specified herein.

**306-1.02 REFERENCE.**

1. Section 401, Hot Mix Asphalt and Surface Treatments.

**MATERIALS**

**306-2.01 COMPOSITION OF MIXTURE - JOB MIX DESIGN (JMD).** Design the JMD according to the Alaska Test Manual (ATM) 417 using the design requirements of Table 306-1 and as specified herein. Recycled Asphalt Pavement may be used to supplement the aggregate and asphalt binder in the ATB.

**TABLE** **306-1**

**ATB Design** **Requirements**

|  |  |
| --- | --- |
| **DESIGN PARAMETERS** | **CLASS**  **“B”** |
| ATB (Including Asphalt Binder) | |
| Stability, Pounds | 1200 min. |
| Flow, 0.01 Inch | 8 - 16 |
| Voids in Total Mix, % | 3 – 5 |
| Compaction, Number of Blows Each Side of Test Specimen | 50 |
| Asphalt Binder | |
| Percent Voids Filled with Asphalt Binder (VFA) | 65 - 78 |
| Asphalt Binder Content, Min. % | 5.0 |
| Dust-Asphalt Ratio**\*** | 0.6 - 1.4 |
| Voids in the Mineral Aggregate (VMA), %, Min. | |
| Type II | 12.0 |
| Recycled Asphalt Pavement (RAP) |  |
| RAP, Max. %. | 25 |

\*Dust-asphalt ratio is the percent of material passing the No. 200 sieve divided by the percent of effective asphalt binder.

The JMD will specify the Target Values (TV) for gradation, the TV for asphalt binder content, the Maximum Specific Gravity (MSG) of the ATB, the additives, and the allowable mixing temperature range.

Target values for gradation in the JMD must be within the broad band limits shown in Table 703-4. For acceptance testing, ATB mixture will have the full tolerances in Table 306-2 applied.

Do not mix ATB produced from different plants for testing or production paving. ATB from different plants will be rejected.

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

1. A letter stating the location, size, and type of mixing plant, the proposed gradation for the JMD including gradations for individual virgin aggregate (aggregate) stockpiles and the RAP stockpile. Provide supporting process quality control information; including the blend ratio of each aggregate stockpile, the RAP stockpile and the RAP asphalt binder content. For mixes with RAP, provide JMD gradation with and without RAP. Provide calibration data if ATM 406 is used for RAP process control.

2 Representative samples of each aggregate (coarse, intermediate, fine, blend material and mineral filler, if any) and RAP required for the proposed JMD. Furnish 100 lbs of each intermediate and/or coarse aggregate, 200 lbs of fine aggregate, 25 lbs of blend sand, and 200 lbs of RAP.

3. Three separate 1-gallon samples, minimum, of the asphalt binder proposed for use in the ATB. 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 (MSDS).

4. One sample, of at least 1/2 pint, of the anti-strip additive proposed, including name of product, manufacturer, and manufacturer's data sheet, and current MSDS.

The Engineer will evaluate the material and the proposed gradation using ATM 417 and Table 306-1 ATB Design Requirements.

The mix, the materials and proposed gradation meeting the specification requirements will become part of the Contract when approved, in writing, by the Engineer.

FAILURE TO MEET SPECIFICATION REQUIREMENTS

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

• The results do not achieve the requirements specified in Table 306-1

• The asphalt binder source is changed

• The source of aggregate, aggregate quality, gradation, or blend ratio is changed

• The source of RAP is changed

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

Payment for ATB will not be made until the new JMD is approved. Approved changes apply only to ATB produced after the submittal of changes.

The Engineer will assess a fee for each mix design subsequent to the approved Job Mix. The fee will be included under Pay Item 306(8\_) ATB, Price Adjustment, Type \_\_\_; Class\_\_.

**306-2.02 AGGREGATES.** Conform to Subsection 703-2.04. Type II, Class B (IIB) total combined aggregates.

Use a minimum of three stockpiles for crushed ATB aggregate (coarse, intermediate, and fine). Place RAP, blend material and mineral filler in separate piles.

**306-2.03 ASPHALT BINDER.** Conform to 702-2.01. If asphalt binder is not specified use PG 52-28.

The total asphalt binder content may be a combination of the asphalt binder specified and the residual asphalt binder in the RAP.

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 anti-strip added.

**306-2.04 ANTI-STRIP ADDITIVES.** Use anti-strip agents in the proportions determined by ATM 414 and included in the approved JMD. At least 70% of the aggregate must remain coated when tested according to ATM 414. A minimum of 0.25% by weight of asphalt binder is required.

**306-2.05 PROCESS QUALITY CONTROL.** Sample and test materials for quality control of the ATB according to Subsection 106-1.03. Submit to the Engineer, with the JMD, a documentation plan that will provide a complete, accurate, and clear record of the sampling and testing results. When directed by the Engineer, make adjust the plan and resubmit.

Submit a paving and plant control plan at the pre-paving meeting to be held a minimum of 7 days before initiating pre-paving operations. Address the sequence of operations. Outline steps to provide product consistency, to minimize segregation, to prevent premature cooling of the ATB, and to provide the mat density required by these specifications. Include a proposed quality control testing frequency for gradation, asphalt binder content, and compaction.

Failure to perform quality control forfeits the Contractor’s right to a retest under Subsection 306-4.02.

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

**306-2.06 RECYCLED ASPHALT PAVEMENT (RAP).** Process existing pavement removed under Subsection 202-3.07 so material passes the 1 1/2" sieve. Stockpile the material separately from the crushed aggregates. Perform one gradation and one asphalt binder content test for every 1000 tons of RAP or a minimum of 10 sets of tests whichever is greater.

**CONSTRUCTION REQUIREMENTS**

**306-3.01 WEATHER LIMITATIONS.** Do not place ATB on a wet surface, on an unstable/yielding roadbed, when the base material is frozen, or when weather conditions prevent proper handling or finishing of the mix. Do not place ATB unless the roadway surface temperature is 40°F or warmer.

**306-3.02 EQUIPMENT, GENERAL.** Use equipment in good working order and free of ATB buildup. Make equipment available for inspection and demonstration of operation a minimum of 24 hours before placement of production ATB.

**306-3.03 ASPHALT MIXING PLANTS.** Meet AASHTO M 156. Use an asphalt plant designed to dry aggregates, maintain accurate temperature control, and accurately proportion asphalt binder and aggregates. Calibrate the asphalt plant and furnish copies of the calibration data to the Engineer at least 4 hours before ATB production.

When using recycled asphalt pavement material, mix the RAP with the aggregate before the aggregate enters the plant thereby adding the RAP combined with the aggregate to the asphalt treated base mixture at one time.

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

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 equipment meeting OSHA safety requirements.

**306-3.04** **HAULING** **EQUIPMENT.** Costs associated with meeting the requirements of Subsection 306-3.04 are subsidiary to Section 306 Pay Items.

Vehicles/Equipment. Haul ATB in trucks with tight, clean, smooth metal beds, thinly coated with a minimum amount of paraffin oil, lime water solution, or an approved manufactured asphalt release agent. Do not use petroleum fuel as an asphalt release agent.

During ATB hauling activities, the hauling vehicle will have covers attached and available for use. Be prepared to demonstrate deployment of the cover when hauling material or empty. Illustrate the efficiency of deployment and how the materials are protected from the environment and the environment is protected from the materials. When directed by the Engineer, cover the ATB in the hauling vehicle(s).

Roadway Maintenance. Daily inspect, remove/clean, and dispose of project materials deposited on existing and new pavement surface(s) inside and outside the project area including haul routes.

The inspection plan and method of removal/cleaning and disposal shall be submitted in writing to the Engineer and approved by the Engineer 7 days before initiating paving operations. Include alternatives, options to immediately correct deficiencies in the inspection plan and methods of removal/cleaning and disposal that may be discovered as the work is being performed.

The Engineer may require the Contractor to include a vehicle/equipment cleaning station(s), to be added at the project site and or at the plant, in the basic plan or as one of the corrective alternatives/options. At a minimum, the cleaning station will include the materials and means to:

(1) Spray truck tires with an environmental degradable release agent if mix adheres to tires before dumping in front of the paving equipment.

(2) Clean off loose mix from gates, chains, and tires that might fall on the pavement of the haul route.

(3) Contain, collect and disposal of (1) and (2).

The Contractor is responsible for the inspection plan, the means, and methods used for removal/cleaning and disposal of fugitive materials/debris. The Contractor is responsible for the damage as a result of not removing these materials (to the roadway material, the users, and others) and the damage to the roadway materials from the removal method(s). Approval does not change the Contractor's responsibility, nor add responsibility to the Department for this work.

Repair damage, as specified in Subsection 306-3.16 Patching Defective Areas, to the existing roadway materials (asphalt type) as a result of the fugitive materials or their removal. Use repair materials of similar type to the damaged material. Attain written approval from the Engineer for the proposed material.

**306-3.05 PAVING EQUIPMENT.** Use self-propelled asphalt pavers with a heated vibratory screed. Control grade and cross slope with automatic grade and slope control devices. Use an erected string line, a 30-foot minimum mobile string line (ski), or other approved grade follower, to automatically actuate the screed or blade control system. Use grade control on either (a) both the high and low sides or (b) grade control on the high side and slope control on the low side.

Use a paver screed assembly that produces a finished surface of the required smoothness, thickness, and texture without tearing, shoving, or displacing the ATB.

Equip pavers with a receiving hopper having sufficient capacity for a uniform spreading operation and a distribution system to place the ATB uniformly in front of screed.

Prevent segregation of the coarse aggregate particles from the remainder of the ATB during paving operations. Specifically equip pavers to prevent segregation between the hopper and augers. Use means and methods approved by the paver manufacturer. Means and methods may include chain curtains, deflector plates, or other similar devices or combination of devices. When required by the Engineer, provide a Certificate of Compliance verifying use of the means and methods required to prevent segregation.

**306-3.06 ROLLERS.**  Use both steel-wheel (static or vibratory) and pneumatic-tire rollers. Avoid crushing or fracturing of aggregate. Use rollers designed to compact ATB asphalt mixtures and reverse without backlash.

All rollers shall have an attached infrared thermometer that measures and displays the surface temperature to the operator.

Use fully skirted pneumatic-tire rollers having a minimum operating weight of 3000 pounds per tire.

**306-3.07 PREPARATION OF EXISTING SURFACE.** Prepare base surface conforming to the Plans and Specifications.

Before placing the hot asphalt mix, apply tack coat material (Section 702) as specified here and in Section 402. Uniformly coat contact surfaces of curbing, gutters, saw cut pavement, cold joints, manholes, and other structures with tack coat material. Allow tack coat to break before placement of ATB on these surfaces.

**306-3.08** **PREPARATION** **OF** **ASPHALT.** Provide a continuous supply of asphalt binder to the asphalt mixing plant at a uniform temperature, within the allowable mixing temperature range.

**306-3.09** **PREPARATION OF** **AGGREGATES.** Dry the aggregate so the moisture content of the ATB, 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 ATB, and the RAP when being used in the mix, 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. ATB containing soot or fuel is unacceptable (Subsection 105-1.11).

**306-3.10** **MIXING.** Combine the aggregate, asphalt binder, and additives in the mixer in the amounts required by the JMD. Mix to obtain 98% coated particles when tested according to AASHTO T 195.

**306-3.11** **TEMPORARY** **STORAGE.** Silo type storage bins may be used, provided the characteristics of the ATB remain unaltered. Changes in the JMD, visible or otherwise, are cause for rejection. Changes may include: visible segregation, heat loss; and the physical characteristics of the asphalt binder, lumpiness, or stiffness of the ATB or similar.

**306-3.12 PLACING AND SPREADING.** Use asphalt pavers to distribute ATB. Place the ATB 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 ATB surface immediately behind the paver for temperature uniformity. Areas with temperature differences more than 25o F lower than the surrounding ATB may produce areas of low density. Contractor shall immediately adjust laydown procedure to maintain a temperature differential of 25o F or less. Thermal images and thermal profile data will become part of the project record and shared with the Contractor.

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

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.

Do not cover/place over the asphalt treated base material until the ATB material throughout that section, as defined by the Paving Plan, is placed and accepted.

Do not pave against new Portland cement concrete curbing until it has cured for at least 72 hours.

Do not place ATB over bridge deck membranes, except as directed by the Engineer.

**306-3.13** **COMPACTION.** Compact the ATB by rolling thoroughly and uniformly. In areas not accessible to large rollers, compact with mechanical tampers or trench rollers. Prevent indentation of ATB. Do not leave rollers or other equipment standing on ATB that is not sufficiently cooled to prevent indentation.

A mat area with density lower than 92.0 % MSG is considered segregated and not in conformance with the requirements of the Contract. The work shall be deemed unacceptable by the Engineer 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 of the JMD will be used for the first lot of ATB. The MSG for additional lots will be determined from the first sublot of each lot.

Acceptance testing for density will be performed according to ATM 410 using a 6 inch diameter core.

**306-3.14 JOINTS.** 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. Place and compact the ATB to provide a continuous bond, texture, and smoothness between adjacent sections of the ATB.

Coordinate the joints in the ATB pavement layer with the layer of HMA pavement above. Offset the longitudinal joints in the HMA pavement layer above from the joint in the ATB asphalt pavement layer immediately below by at least 6 inches.

Form transverse joints by cutting back on the previous run to expose the full depth of the layer. Saw cut the joint, use a removable bulkhead or other method approved by the Engineer.

Remove to full depth improperly formed joints resulting in surface irregularities. Before removing pavement, cut a neat straight line along the pavement to be removed and the pavement to remain. Use a power saw or other method approved by the Engineer. Replace the removed asphalt with new ATB and thoroughly compact.

**306-3.15 SURFACE TOLERANCE.** Costs associated with meeting surface tolerances are subsidiary to the ATB Pay Items.

The Engineer will test the finished surface after final rolling at selected locations using a 10 ft straightedge. Correct variations from the testing edge, between any two contacts, of more than 1/4 inch.

**306-3.16** **PATCHING** **DEFECTIVE** **AREAS.** Costs associated with patching defective areas are subsidiary to the ATB Pay Items.

Remove defective ATB for the full thickness of the course, do not skin patch. Cut the pavement so that edges are vertical and the sides are parallel to the direction of traffic. Coat edges with a tack coat meeting Section 402 and allow to cure. Place and compact fresh ATB to grade (Subsection 306-3.13) and surface tolerance requirements (Subsection 306-3.15).

**306-4.01** **METHOD** **OF** **MEASUREMENT.** Section 109 and the following:

1. Asphalt Treated Base.

a) By weighing. No deduction will be made for the weight of asphalt binder or anti stripping additive or cutting back joints.

2. Asphalt Binder. By the ton, as follows.

Method 1:

Percent of asphalt binder for each sublot multiplied by the total weight represented by that sublot. The same tests used for the acceptance testing of the sublot will be used for computation of the asphalt binder quantity. If no acceptance testing is required, 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 may be used on projects where deliveries are made in tankers and the asphalt plant is producing ATB for one project only.

The Engineer may direct, at any time that tankers be 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 will be 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 ATB will be calculated using the target value for asphalt binder as specified in the JMD.

Method 1 will be used for determining 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 will be made for any asphalt binder more than 0.4% above the optimal asphalt binder content specified in the JMD.

3. ATB, Price Adjustment, Type ; Class . By the fees specified in Subsections 306-2.01, 4.02, and 5.01.

**306-4.02 ACCEPTANCE SAMPLING AND TESTING.**

1. Asphalt Treated Base

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

A lot is normally 10,000 tons. The lot is divided into sublots of 1000 tons, each randomly sampled and tested for asphalt binder content, density, and gradation according to this subsection. The lot is evaluated for acceptance according to Subsection 306-4.03. 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 acceptance 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 acceptance will be based on the actual number of test results in the shortened lot. If there are less than 3 sublots, the ATB will be accepted for payment based on the Engineer's approval of the JMD, and placement and compaction of the ATB 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 acceptance will be based on the actual number of test results (excluding outliers) in the shortened lot.

If the bid quantity is between 3,000 to 10,000 tons, the quantity is considered one lot. The lot is divided into sublots of 1000 tons, and each randomly sampled and tested for asphalt binder content, density, and gradation according to this subsection.

ATB quantities of less than 600 tons remaining after dividing the Contract quantity into sublots will be included in the last sublot. ATB quantities of 600 tons or greater will be treated as an individual sublot.

For bid quantity less than 3,000 tons, ATB will be accepted for payment based on the Engineer's approval of a JMD and the placement and compaction of the ATB to the specified depth and finished surface requirements and tolerances.

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

a. Asphalt Binder Content. ATB 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, except ATM 405 will not be used when RAP is included in the mixture.

b. Aggregate Gradation. Aggregates tested for gradation acceptance will have the full tolerances from Table 306-2 applied. For ATB 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 mat core sample. 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.

Take core samples according to ATM 413 in the presence of the Engineer. Cut full depth core samples centered on the marks from the finished ATB 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 ATB 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 306-2.05 Process 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 to evaluate the material for acceptance. 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 evaluation. 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 the Department's regional 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 will normally be 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.

**306-4.03** **EVALUATION** **OF** **MATERIALS** **FOR** **ACCEPTANCE.** A mat area of finished surfacing that is contaminated with foreign material; is segregated (determined visually or by testing), has a lower density than specified, fails to meet surface tolerance requirements, is flushing or bleeding asphalt binder after compaction is complete, or in any other way determined to be defective is unacceptable according to Subsection 105-1.11. ATB, not meeting the specified limits noted in Table 306-2, is considered defective. Correct unacceptable work and materials according to Subsection 306-3.16 and as directed by the Engineer.

**TABLE 306-2**

**LOWER SPECIFICATION LIMIT (LSL) & UPPER SPECIFICATION LIMIT (USL)**

|  |  |  |
| --- | --- | --- |
| **Measured Characteristics** | **LSL** | **USL** |
| 3/4-inch sieve 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.

Asphalt binder will be randomly sampled and tested in accordance with Subsection 306-4.02. Provide supplier process control test results with the delivery ticket for each load of asphalt binder to the Engineer before unloading asphalt binder at the project. No payment will be made without this documentation.

**306-4.04 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.

**306-5.01 BASIS** **OF** **PAYMENT.**

Except where specified as individual Pay Items the work and materials associated with:

Asphalt binder, anti-stripping additives, surface tolerance corrections, patching defective areas; removal and disposal of rejected ATB, and the hauling equipment are subsidiary to the Asphalt Treated Base Pay Items.

Item 306(8\_) ATB, Price Adjustment, Type \_\_\_; Class \_\_: is the sum of the price adjustment for the fees assessed the Contractor including:

• Each mix design subsequent to the approved Job Mix Design (Subsection 306-2.01) will result in a fee of $2500.00 each.

• Failure to cut core samples within the specified period will result in a fee of $100.00 per sample per day (Subsection 306-4.02).

• Failure to backfill voids left by sampling within the specified period will result in a fee of $100 per hole per day (Subsection 306-4.02).

• Contractor retesting, referee sample testing and Contractor requested testing for visually inspected and rejected asphalt treated base failing to meet specifications will result in a fee being assessed for all costs associated with the test (Subsection 306-4.02, 4.03).

Item 306(15). Asphalt Material Price Adjustment.

For each Section as included in Subsection 306-4.04 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.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

306(1) ATB Ton

306(2) Asphalt Binder, Grade PG ##-## X Ton

306(8\_) ATB, Price Adjustment, Type \_\_\_; Class \_\_ Contingent Sum

306(15) Asphalt Material Price Adjustment Contingent Sum

CR306-040120.SSHC2017

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:

|  |  |
| --- | --- |
| **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.** 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 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.

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.

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 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 by the Engineer, 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 all equipment available for inspection and demonstration of operation a minimum of 24 hours before placement of 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 trucks with tight, clean, smooth metal beds. Keep beds free of petroleum oils, solvents, or other materials that would adversely affect the mixture. Apply a thin coat of approved asphalt release agent to beds as necessary to prevent mixture adherence. Provide trucks with covers attached and available for use.

When directed by the Engineer, 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 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.

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 Portland cement concrete curbing until it 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.** Thoroughly and uniformly, compact the HMA by rolling. 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. 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 course or by using a removable bulkhead. 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 0.25”, 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. If the use of WMA is approved by the Engineer, 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 for determining 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.

**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 the Department's regional 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:

[f3/4 inch (PF3/4 inch) + f1/2 inch (PF1/2 inch) +....fac (PFac)]

CPF =

Σf

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 = [(CPF or DPF)\* -1.000] x (tons in lot) x (PAB)

\* CPF or DPF, whichever is lower

PAB = Price Adjustment Base = $110.00 per ton.

The HMA Price Adjustment is the sum of the price adjustments for each lot and paid for under Item 401(8\_).

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

The longitudinal Joint Density Price Adjustment is the total price adjustment paid for under Item 401(9).

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), and/or Method 2 (pavement placed over existing pavement). 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.

The Pavement Smoothness Price Adjustment is the total price adjustment paid for under Item 401(10).

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 401-3.01-1 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 V | JNR 3.2 | ≤ 0.39 | 0.40–0.50 | 0.51–0.59 | 0.60–0.69 | 0.70–1.00 | > 1.00 |
| % Rec3.2 | ≥ 86.0 | 85.9–75.0 | 74.9–68.0 | 67.9–60.0 | 59.9–55.0 | < 55.0 |
| PG 58-34 E | JNR 3.2 | ≤ 0.19 | 0.20–0.25 | 0.26–0.29 | 0.30–0.39 | 0.40–0.50 | > 0.50 |
| % Rec3.2 | ≥ 90.0 | 89.9–85.0 | 84.9–80.0 | 79.9–75.0 | 74.9–70.0 | < 70.0 |
| PG 64-40 E | JNR 3.2 | < 0.05 | 0.05–0.10 | 0.11–0.15 | 0.16–0.20 | 0.21–0.25 | > 0.25 |
| % Rec3.2 | ≥ 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 V,  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 JNR 3.2 or % Rec3.2 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.

The Asphalt Binder Price Adjustment is the sum of the price adjustments for each lot and paid for under Item 401(21).

**401-4.04 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.

**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

• Patching 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.

a. 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(8\_), 401(9), 401(10) and 401(21) do not apply.

b. Failed. The materials, construction of, removal and disposal of a failed test strip will be at the Contractor’s expense.

Item 401(5) HMA, Temporary, Type ; Class . Removal and disposal of temporary HMA is subsidiary.

The following price adjustment Pay Items, unless included as individual Pay Items in the bid schedule, are paid under 401(22) Combined Price Adjustment.

401(8\_) HMA Price Adjustment, Type ; Class ,

401(9) Longitudinal Joint Density Price Adjustment,

401(10) Pavement Smoothness Price Adjustment, Method .

401(21) Asphalt Binder Price Adjustment

Item 401(8\_) HMA Price Adjustment, Type ; Class , is the sum of the price adjustments for each material lot, and for deductions and fees assessed. Deductions and fees assessed include:

• Each mix design subsequent to the approved JMD for each type and class of HMA specified will result in a fee of $6000.

• 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 will be assessed.

Item 401(8\_) HMA Price Adjustment, Type ; Class , and 401(22) Combined Price Adjustment do 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.

Item 401(15) 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.

Item 401(16) Crack Repair. Cleaning loose material from cracks, asphalt binder, and HMA to fill cracks are subsidiary.

Item 401(17) Prelevel for Ruts, Delaminations, and Depressions. Cleaning loose material, asphalt binder, and HMA are subsidiary.

Item 401(18) Repair Unstable Pavement. Removal of pavement and base course, asphalt binder, and HMA are subsidiary.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

401(1\_) HMA, Type ; Class Ton

401(2) HMA, Leveling Course, Type IV ; Class B Lane-Station

401(3) HMA, Leveling Course, Type IV ; Class B Ton

401(4) Asphalt Binder, Grade PG ##-## X Ton

401(5) HMA, Temporary, Type II ; Class B Ton

401(6) HMA, Type , Class Square Yard

401(7) Liquid Anti-Strip Additives Contingent Sum

401(13) Job Mix Design Each

401(14) Joint Adhesive Linear Foot

401(15) Asphalt Material Price Adjustment Contingent Sum

401(16) Crack Repair Linear Foot

401(17) Prelevel for Ruts, Delaminations, and Depressions Square Yard

401(18) Repair Unstable Pavements Square Yard

401(22) Combined Price Adjustment Contingent Sum

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DIVISION 500 — STRUCTURES

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SECTION 501  
STRUCTURAL CONCRETE

Special Provisions

**501-5.01 basis of payment.** Add the following:

Headwall. Complete in place with all hardware and structural fill as shown on the plans or as directed by the Engineer.

Pay Item No. Pay Item Pay Unit

501(10) Headwall, Type I Each

501(11) Headwall, Type II Each

Z524610000

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.

For installation of highway lighting piles, the wave Equation Analysis is not required.

**505-5.01 BASIS OF PAYMENT.** Add the following:

When 505 Pay Items do not appear in the bid schedule furnishing and installing piles for lighting

standards is subsidiary to Pay Item 660(3) Highway Lighting System Complete.

CR505.2/Z524610000

DIVISION 600 — MISCELLANEOUS  
CONSTRUCTION

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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.

**603-1.02 REFERENCES.**

ASTM D3953 Standard Specification for Strapping, Flat Steel and Seals

ASTM D4675 Standard Guide for Selection and Use of Flat Strapping Materials

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

Bedding and Backfill Subsection 204-2.01

Joint Mortar Subsection 705-2.04

Flexible Watertight Gaskets Subsection 705-2.05

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

Polymer Coated Corrugated Steel Pipe Subsection 707-2.08

Galvanize Subsection 716-2.07

Culvert Marker Posts (Flexible Delineator Posts) Subsection 730-2.05

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Item 603(17-xx), 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.

For steel and plastic pipe, match the 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./ft2 surface or .0002 inch thick minimum. Push type seals, Style III (overlap), regular duty, galvanized Finish B (hot-dipped coating) by 1.75-inch minimum length and matched to strapping width.

**CONSTRUCTION REQUIREMENTS**

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

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

**603-3.02. LAYING PIPE.** Begin the pipe laying at the downstream end of the pipe. Keep the lower segment of the pipe in contact with the bedding throughout its full length. Place bell or groove ends of rigid pipe and outside circumferential laps of flexible pipe facing upstream.

Lay paved or partially lined pipe so that the longitudinal centerline of the paved segment coincides with the flow line. Install elliptical conduit and circular conduit reinforced with other than a full circular cage or cages so the orientation of a vertical plane through the longitudinal axis of the conduit does not vary more than 5 degrees from the design orientation.

Repair damaged metallic coating on metal pipe according to AASHTO M36.

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

When storm drain pipe or culverts cross over a water line, meet a minimum vertical separation of 18 inches, per 18 AAC 80.020 Drinking Water.

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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.

When storm drain pipe or culverts cross over a water line, joints must maintain a minimum distance of 9 feet from the water line per 18 AAC 80.020 Drinking Water.

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1. 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 the metal pipe firmly using connecting bands conforming to ASTM B745 (Corrugated Aluminum Pipe) and ASTM A760 (Corrugated Steel Pipe) and as noted herein. Use bands that are no more than two nominal sheet thicknesses lighter than the pipe jointed, and in no case more than 0.052 inches lighter. Include a gasket each side of the gap.

a. Primary Band. Furnish and install corrugated bands so that the band corrugations match and conform to the corrugations of the pipe. Conform to the following guidelines:

(1) The gap between the pipes joined is in the center of the band and is no wider than one corrugation width.

(2) Band for 12-inch through 30-inch diameter pipe are at least 12 inches wide.

(3) Bands for pipe with diameters greater than 30 inches are at least 22 inches wide.

b. Secondary Band. Use this band only where it is not physically possible to use primary bands, such as on field-cut pipe ends, joining new pipe to existing pipe, etc. Furnish and install deformed metal sheet bands (dimple bands) so that the projections match and are the same depth as the pipe corrugations. Form these projections in circumferential rows with one projection for each corrugation of the helical pipe.

Conform to the following guidelines:

(1) The gap between the pipes joined is in the center of the band and is no wider than 2 inches.

(2) Bands for 12-inch diameter pipe are at least 12 inches wide and have one circumferential row of projections for each pipe end joined.

(3) Bands for pipe with diameters greater than 12 inches are at least 24 inches wide and have two circumferential rows of projections for each pipe end joined.

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

Furnish all bolted connections on coupling bands with cut washers placed between the nut and the angle bracket or use nuts with integral washers.

Take up any pipe that is out of alignment, unduly settled, or damaged and re-lay or replace it.

**603-3.04 CULVERT MARKER.**

a. 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

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

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

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

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

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

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

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

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

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

CR603/Z524610000

Culvert markers are subsidiary to the pipe.

Excavation, bedding, and backfill paid under Section 204.

Payment will be made under:

Pay Item No. Pay Item Pay Units

603(1) CSP \_\_\_ Inch Linear Foot

603(2) \_\_\_ Inch CSP Arch Linear Foot

603(3) End Section for CSP \_\_\_ Inch Each

603(4) End Section for \_\_\_ Inch CSP Arch Each

603(9) Corrugated Aluminum Pipe \_\_\_ Inch Linear Foot

603(10) \_\_\_ Inch Corrugated Aluminum Pipe Arch Linear Foot

603(11) End Section for Corrugated Aluminum Pipe \_\_\_ Inch Each

603(12) End Section for \_\_\_ Inch Corrugated Aluminum Pipe Arch Each

603(13) Reinforced Concrete Pipe, \_\_\_ Inch, Class \_\_\_ Linear Foot

603(14) Reinforced Concrete End Section, \_\_\_ Inch Each

603(15) Elbow, (Type & Size) Each

603(16) Branch Connection (Type & Size) Each

603(17) Pipe \_\_\_ Inch Linear Foot

603(19) \_\_\_ Inch Pipe Arch Linear Foot

603(20) End Section for Pipe \_\_\_ Inch Each

603(22) Corrugated HDPE Pipe \_\_\_ Linear Foot

603(23) End Section for Corrugated HDPE Pipe \_\_\_ Each

603(24) Polymer Coated CSP \_\_\_ Inch Linear Foot

CR603/Z524610000

SECTION 604  
MANHOLES AND INLETS

Special Provisions

**604-1.01 DESCRIPTION.** Add the following:

**Sanitary Sewer and Storm Drain Facilities – Condition Inspections and Item Replacement**

Sanitary Sewer Facilities:

Coordinate with the Engineer and City of Homer (COH); and participate in a pre-construction condition inspection, and a post-construction condition inspection of the sanitary sewer facilities.

Storm Drain Facilities:

Coordinate with the Engineer and participate in a pre-construction condition inspection of the storm drain facilities.

The pre-construction inspections may identify additional items, manhole metal frames, covers, lids, catch basin inlets and grates, to be repaired and or replaced. Make repairs and or replace additional facility items as directed by the Engineer.

**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.

**Sanitary Sewer and Storm Drain Facilities – Condition Inspections and Item Replacement**

Contractor furnishes the required traffic control, including personnel to assist, while performing inspections.

The Contractor forfeits all right to assert pre-existing damage if the Contractor fails to participate in the inspections.

Make repairs and install the replacement facility items as shown in the Plans.

Sanitary Sewer Facilities:

During inspections the COH representative, the Engineer and the Contractor will observe each facility's location and condition. The Engineer with concurrence of the COH will indicate the additional facility items to be replaced.

Provide 3 days advance written notice to COH scheduling a pre-construction inspection of the facilities. Conduct this inspection before pavement removal begins. Contact the COH Director of Public Works to determine where to send the written notice, (907) 435-3124.

COH furnishes the sanitary sewer manhole frames and covers for preexisting damages only. Contact the COH Director of Public Works to schedule the pick-up of the furnished materials. Allow 3 working days from the time contact is made to pick-up of the materials.

Salvage the replaced manhole frames and covers. Coordinate with, and deliver to COH the salvaged materials.

Provide written notice to COH scheduling a post-construction inspection of the facilities, after the paving operations are complete and 3 days in advance of the inspection.

Provide the Engineer a copy of the written notices.

Storm Drain Facilities:

Contact the Engineer, a minimum of 15 days in advance, to schedule a pre-construction inspection of the storm drain facilities. Conduct this inspection before pavement removal begins.

During inspections the Engineer and Contractor will observe each facility's location and condition. The Engineer will indicate the additional facility items to be replaced.

Contractor furnishes the storm drain manhole frames and lids; and catch basin inlets and grates.

Dispose of storm drain materials and sanitary sewer materials not wanted by COH, according to the Kenai Peninsula Borough rules and regulations.

CR604.1/Z524610000

**604-5.01 BASIS OF PAYMENT.** Add the following:

Pay Items 604(13B), Item 604(13D), and Item 604(13E) include full compensation for labor, equipment, and incidental materials for installation, complete-in-place after final paving as accepted by the Engineer, including but not limited to:

• Inspections

• Removal and disposal of existing manhole metal frame and cover/lid; and catch basin inlets and grates

• Repairs and installing the replacement materials

• Adjusting the facility item down prior to the planing operation

• Adjusting the facility item up prior to the paving operation

Repairs to facilities damaged or rendered inoperable, after the pre-construction inspection and before the final inspection, are the responsibility of the Contractor and no additional payment will be made.

All traffic control required for the inspections will be paid under the 643 Pay Items.

Except as being paid under Pay Item 604(13B), (13D), and (13E), existing manholes being adjusted by raising or lowering the frame or ring casting 12" or less – comply with Subsection 604-3.01, paragraph beginning, "adjust existing manhole or inlet …" The corresponding Pay Item for this adjustment is 604(4) Adjust Existing Manhole.

Add the following Pay Items:

Pay Item No. Pay Item Pay Unit

604(13B) Replace Inlet Frame and Grate Each

604(13D) Remove and Replace Sewer Manhole Frame and Lid Each

604(13E) Remove and Replace Storm Drain Manhole Frame and Lid Each

CR604.1-061520/ Z524610000

SECTION 606  
GUARDRAIL

**606-1.01 DESCRIPTION.** Add the following:

Furnish and install bollard(s) included in the Plans and Specifications.

CR606.9-020119R

**606-2.01 MATERIALS.** Add the following:

Bollards.

Concrete; Class B Subsection 550-2.01

Shapes, Plates and Bars ASTM A 36

Bollard Pipe Subsection 716-2.06

Bollard Tube ASTM A 500, Grade B

Welding Subsection 716-2.02

Galvanizing Subsection 716-2.07

Galvanizing Repair ASTM A 780

Paint (Paint for Steel Structures/Paint of Timber) Subsection 708-2.01/2.02

Bollard Post (WCLIB; Posts and Timbers, Douglas Fir-Larch No. 1) Subsection 713-2.01

Preservatives and Pressure Treatment Process for Timber Subsection 714-2.01

Backfill Material (Selected Material, Type A) Subsection 703-2.07

Retroreflective Bands (6 inch wide reflector, smooth surface bands) ASTM D4956, Type III-A

CR606.9-020119R

Add the following subsection:

**606-3.13 BOLLARDS.**

1. Steel Bollards. Galvanize all steel members and hardware.

a. Perform all welding according to AWS D1.1.

b. Shop galvanize steel bollards and associated hardware, after fabrication. Repair damage to galvanizing after installation.

2. Wood Bollards. Preservative treat all wood material.

a. Treat field cuts, bolt holes, and similar according to AWPA Standard M4.

Install bollards in concrete, plumb, back fill with specified material, and compact to the satisfaction of the Engineer. Provide the Engineer with lock keys.

Shop paint steel bollards with one coat of primer and two top coats of safety yellow. At the site repair nicks, scratches, and other damage. In the shop and field, clean, prepare the surface and apply the materials as recommended by the manufacturer.

Apply two white retroreflective bands placed 3-4 inches from the top with a maximum of 6 inches between the bands.

**606-5.01 BASIS OF PAYMENT.** Add the following:

Bollards are subsidiary to Pay Item 627(5) Fire Hydrant Installation including:

|  |  |  |
| --- | --- | --- |
| • Concrete | • Excavation & backfill | • Grading |
| • Painting & repair |  |  |

CR606.9-020119R

SECTION 608  
SIDEWALKS

Special Provisions

**608-1.01 DESCRIPTION.** Replace the 1st sentence with: Construct asphalt or concrete sidewalks and bike or curb ramps.

Z524610000

Add the following: Construct asphalt (HMA) pathways and medians.

CR608.1-040119

**608-2.01 MATERIALS.** Delete paragraph number 2 and substitute the following:

2. Asphalt (HMA)

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

CR608.1-040119

**608-3.01 CONCRETE SIDEWALKS.** Replace paragraphs 5 and 6 with the following:

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.

Z524610000

Add the following Subsection 608-3.05:

**608-3.03 CURB RAMPS.** Add the following: Measure curb ramp slopes with a 24-inch electronic level. Calibrate and operate the level according to the manufacturer's instructions.

Add the following Subsection 608-3.05:

**608-3.05 ASPHALT PATHWAYS AND MEDIANS.** Construct pathways and medians according to Subsection 608-3.02, Asphalt Sidewalks.

CR608.1-040119

Add the following Subsection 608-3.06 Bike Ramps:

**608-3.06 BIKE RAMPS.** Construct bike ramps according to the details and the locations shown on the Plans. Follow the construction requirements of Subsection 608-3.01. Give the exposed concrete surface a coarse broom finish.

Z524610000

**608-4.01 METHOD OF MEASUREMENT.** Add the following:

Asphalt Pathways, and Medians are measured by the ton of HMA.

Additional 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.

CR608.1-040119

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

Z524610000

**608-5.01 BASIS OF PAYMENT.** Add the following:

Asphalt binder is subsidiary to related asphalt Pay Items.

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

Payment will be made under:

Pay Item No. Pay Item Pay Unit

608(7) Asphalt Pathway Ton

608(8) Asphalt Medians Ton

608(9) Bike Ramp Each

CR608.1/ Z524610000

SECTION 609  
CURBING

Special Provisions

Replace Subsection 609-3.05 Backing Curb with the following:

**609-3.05 BACKING CURB.** Construct backing curb according to the details and the locations shown in the Plans.

**609-5.01 BASIS OF PAYMENT.** Add the following:

Payment will be made under:

Pay Item No. Pay Item Pay Unit

609(3A) Backing Curb, Type A – 24 Inches Wide x 6 Inches Thick Linear Foot

609(3B) Backing Curb, Type B – 24 Inches Wide x 12 Inches Thick Linear Foot

Z524610000

Special Provisions

Replace Section 610 with the following:

SECTION 610  
DITCH LINING

**610-1.01 DESCRIPTION.** Construct ditch lining at the locations on the Plans or as staked.

**610-2.01. MATERIALS.** Use crushed stones that are angular, hard, sound, and durable with at least one face resulting from fracture.

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

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

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

4. Gradation—ATM 304:

a. maximum of 6 inches in greatest dimension

b. not more than 50% by weight passing a 3-inch sieve,

c. not more than 5% passing a 1-inch sieve

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

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

**610-4.01 METHOD OF MEASUREMENT.** Section 109.

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

Payment will be made under:

Pay Item No. Pay ItemPay Unit

610(1) Ditch Lining Cubic Yard

610(2) Ditch Lining Ton

610(3) Ditch Lining Station

CR610-060117

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.

CR611.1-020119

Special Provisions

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 approval before fabrication. 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.

Use Class A concrete meeting the requirements of Section 501 for overhead Sign support foundations.

Use Class B concrete for steel-reinforced roadside sign foundations meeting the requirements of Section 550. Concrete for other sign foundations may be Class W.

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, 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 YF: 20%

b. Minimum Total Luminance Factor YT: 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.

a. Property of the State. When 615-3.01 7a identifies a maintenance station to receive sign salvage, the signs (sign panels, posts, and hardware) are the property of the State.

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 their hardware. Deliver sign panels, posts, and hardware to the State Maintenance Station noted in these Special Provisions. Do not deliver salvaged materials until inspected and approved by the Engineer. Replace any items damaged by you at no additional cost to the Department.

Deliver salvaged sign panels, posts, and hardware to the State Maintenance and Operations Station, located at:

MP 168.8 Sterling Highway in Homer, AK.

b. Property of the Contractor. When 615-3.01 7a does not identify a State Maintenance and Operations Station; the signs salvaged (sign panels, posts, and hardware) are the property of the Contractor.

Remove project signs and/or parts designated for salvage, off the project site.

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. All signs and posts at a single installation considered as one unit.

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

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.

When Items 615(2), 615(3), or 615(6) do not appear on the bid schedule, this work is subsidiary.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

615(1) Standard Sign Square Foot

615(2) Remove and Relocate Existing Sign Each

615(3) Remove and Relocate Milepost Each

615(4) Delineator, Rigid Each

615(5) Delineator, Flexible Each

615(6) Salvage Sign Each

615(7) Salvage and Dispose Sign Each

CR615-010120

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 MSFc)** |
| **Grass Seed Mix a, b** | Nortan – Tufted Hairgrass  Arctred – 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 ft2.

**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 groundcover will be inspected considering each station and each side of the road a separate area. Acceptance of the cover requires a minimum of 70% 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.** For each area accepted, the establishment period extends one complete growing season following 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.

M Gal equals 1000 gallons.

**618-5.01 BASIS OF PAYMENT.**

1. Pay Items 618(1) and (2) 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(3) Water for Seeding. Payment is for water applied for growth of vegetative groundcover through the establishment period. Water for hydraulic application of materials is subsidiary to Pay Items 618(1) and (2).

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

Payment will be made under:

Pay Item No. Pay Item Pay Unit

618(1) Seeding Acre

618(2) Seeding Pound

618(3) Water for Seeding M Gal.

CR618-050118R

See the blue boxes at the end of the provision for further seed mix information and options.

**Typical Seed Mixes**

All mixes applied at 1.5 lb/MSF

Standard:

Seed mix as included in the provision.

Nortan – Tufted Hairgrass 40% 0.60 lbs.

Arctred – Red Fescue 30% .45 lbs.

Wainwright – Slender Wheatgrass 25% .38 lbs.

Annual Rye Grass 5% .07 lbs.

Total = 100% 1.50 lbs.

Alpine: (possibly Turnagain Pass or similar)

Nortan – Tufted Hairgrass 40% 0.60 lbs.

Arctred – Red Fescue 30% 0.45 lbs.

Gruening – Alpine Bluegrass or Glaucous – Tundra Bluegrass 25% 0.38 lbs.

Annual Rye Grass 5% 0.07 lbs.

Total = 100% 1.50 lbs.

Wetland:

Egan Sloughgrass (American) 40% 0.60 lbs.

Norcoast – Tufted Hairgrass 30% 0.45 lbs.

Nortan – Tufted Hairgrass 20% 0.30 lbs.

Sourdough – Bluejoint Reedgrass 5% 0.08 lbs.

Annual Rye Grass 5% 0.07 lbs.

Total = 100% 1.50 lbs.

Recommend contacting the Alaska Plant Material Center to confirm each mix each project. Avoid seed mixes that are wildlife attractants (Bluegrass is an example of a wildlife attractant, Bluegrass is also not native to Alaska). Projects that need to reseed very small disturbed areas might use the Standard mix. At a minimum the Alpine and Wetland mixes might be used based on the designer's experience.

These seed mixtures are **NOT** meant to be used as a blanket recommendation for all projects.

Contact:

Alaska Plant Materials Center

5310 S. Bodenburg Spur

Palmer, Alaska 99645

Ph: 907 745 8108

Casey Dinkel [casey.dinkel@alaska.gov](mailto:casey.dinkel@alaska.gov)

Phil Czapla [phil.czapla@alaska.gov](mailto:phil.czapla@alaska.gov)

Include: Section 619/CR619 Soil Stabilization; Section 724/CR724.1 Seed; 726/CR726.1 Topsoil and 727/CR727 Soil Stabilization Materials when including CR618.

Special Provisions

Replace Section 626 with the following:

SECTION 626  
SANITARY SEWER SYSTEM

**626-1.01 DESCRIPTION.** Construct or reconstruct sanitary sewer mains, services, cleanouts, manholes, and appurtenances to conform to the Plans. Construction consists of all operations pertaining to furnishing and installing pipe, jointing, cleanouts, testing of sanitary sewers, sanitary sewer manholes, frames, covers.

**626-2.01 MATERIALS.** Use materials that conform to the following:

Bedding and Backfill Subsection 204-2.01

Concrete for Plugs Subsection 550-Class W

Joint Mortar Subsection 705-2.04

PVC Pipe Subsection 706-2.05

Polypropylene Pipe Subsection 706-2.09

HDPE Pipe Subsection 706-2.08

Arctic HDPE Pipe Subsection 706-2.08

Ductile Iron Pipe Subsection 707-2.05

Arctic Ductile Iron Pipe Subsection 707-2.05

Frames, Grates, and Covers Subsection 712-2.06

**626-3.01 GENERAL.** Complete the sanitary sewer system and make sure it operates properly at the time of acceptance of the work. Furnish and install all incidental parts not shown on the Plans or specified in this Section that are necessary to complete the sanitary sewer system.

Meet the applicable provisions of Sections 201, 202, 204, 603, 635 for all clearing and grubbing, removal, excavation, bedding, backfill, conduit, appurtenances, and insulation.

Consult the Plans for estimated locations of existing sewer mains, water mains, and other utilities near the constructions. Use this data for informational only. The Department does not guarantee their accuracy. Confirm and mark the exact locations of all existing utilities before starting work.

Give at least 24 hours advance notice before interrupting sewer service to any area. Restore disrupted sewer service as soon as possible, or make approved temporary service connections.

If operations cause service interruptions, you are responsible for all damages.

The Contractor is to stagger the joints for the sewer pipe such that no joint is closer than ten feet (10’) from the centerline crossing of water to sewer. In addition, where water and sewer mains and services intersect, the vertical separation between the water and sewer pipe is to be a minimum of eighteen (18”) between exterior pipe surfaces.

Where sewer mains intersect with water mains, the sewer main must be encased in a pipe as shown on the Plans. The Contractor shall install casing pipe spacers a maximum of one foot (1’) from each side of each sewer pipe joint. The maximum distance between spacers is to be eight feet (8’). Casing pipe shall be water tight. The Contractor shall grout annular space between carrier pipe and casing pipe. Ends of the casing pipe shall be sealed with rubber seals and bands. Encasement of the carrier pipe, grouting, and end seals shall be completed prior to installing the sewer main segment intersecting with the water main. Grouting required for the encasement of the carrier pipe shall be done at least seven (7) days in advance of sealing the ends of the casing pipe, as to allow for adequate curing time.

The Contractor will lay out (in the field) the alignment and grade of work to be done under the Contract. Once laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their proper replacement. The Contractor shall be responsible for, and pay all costs for the transfer of control points from the reference hubs to such hubs or batter boards as required or needed for the prosecution of the work. A ground line profile will be made by the Contractor.

The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the invert of pipe, except where otherwise noted.

**626-3.02 INSTALLATION OF SEWER CONDUIT.** Variance of individual pipe sections from established line and grade shall not be greater than those listed in the table below, providing that such variance does not result in a level or reverse sloping invert.

The allowance tolerance is per twenty linear feet.

|  |  |  |  |
| --- | --- | --- | --- |
| Diameter (Inches) | Allowance Tolerance (Feet) | Diameter (Inches) | Allowance Tolerance (Feet) |
| 4 | 0.03 | 12 | 0.03 |
| 6 | 0.03 | 14 | 0.04 |
| 8 | 0.03 | 16 | 0.04 |
| 10 | 0.03 | 18\* | 0.05 |

\*Note: For all pipe sizes over eighteen inches (18”) in diameter, variance shall not exceed 0.05 feet.

During the progression of work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides, from the control points and bench marks provided in the plans. The Contractor shall provide qualified personnel to use such instruments and who shall have the duty and responsibility for placing and maintaining such construction guides.

If the method of transferring grades from the offset hubs to the pipe requires batter boards, they shall be at least 1” x 6” supported on 2” x 4” stakes or approved metal rods and shall be placed every twenty-five feet (25’). At least three (3) boards must be in place at any given time to facilitate checking of line and grade. Both line and grade shall be checked for each piece of pipe laid, except at tunnels where methods acceptable to the Engineer shall be used to carry forward line and grade.

The practice of pushing in uncompacted backfill over a section of pipe to provide a platform for transit and level alignment and grade observation shall be subject to the approval of the Engineer. If intermittent back-filling is allowed, back-filling shall be accomplished in accordance with Section 204 of the specifications. All trench excavation and compaction shall be considered incidental to pipe laying. Imported trench backfill which is requested by the Engineer or called out on the plans will be paid under the appropriate pay item or by letter of agreement.

Pipe laying shall not progress ahead of back-filling of excavated trenches more than one hundred feet (100’). Pipe laying shall in all cases proceed upgrade with the spigot ends of the pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe.

The alignment of the installed pipe shall appear straight to visual observation and shall be such that a full circle of light can be seen, when sighting along all points of the pipe circumference unless otherwise required by the Contract documents or directed by Engineer.

Each section of pipe shall be handled carefully and placed accurately. The spigot end shall be fully inserted and care shall be exercised to avoid over-insertion. Clean all foreign matter from sewer conduit before joining. Each section of pipe shall be properly supported to insure true alignment and an invert that is smooth and free from roughness or irregularity.

When work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substance will enter the pipe or fittings. Keep trenches free of standing water until joints are completed.

Where a project outfalls into an existing sanitary sewer, construction of the physical connection to the existing line shall be delayed until all upstream underground construction, including exfiltration testing, is complete and accepted unless special permission is granted by the City. Care shall be exercised during construction, flushing, and testing operations of the connecting link, to assure that water is not diverted into any portion of a sanitary sewer line in service or a sanitary sewer line which is not a portion of the construction project for which the Contractor is responsible.

**626-3.03 TESTING OF SEWER CONDUIT.** The Contractor shall clean and flush all sanitary sewer pipe installed prior to testing and final inspection.

All sanitary sewer pipe installed shall be subject to either an infiltration test or an exfiltration test. In areas where, in the opinion of the Engineer, the water table is high enough to subject the pipe to a satisfactory infiltration test, it is not anticipated that an exfiltration test shall be required. In checking leakage, there will be no allowance made for external hydrostatic head.

Where, in the opinion of the Engineer, the water table is not high enough to provide a satisfactory infiltration test, an exfiltration test shall be required.

The type of test (either infiltration or exfiltration) shall be determined by the Engineer. The Contractor shall have the option of choosing only one (1) method (air or water) of testing for each section tested.

All wyes, tees, or ends of side sewer stubs and service connections shall be plugged or capped, and the plug or cap shall be securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for extending the lateral connection.

The lengths of service connections shall be included in the computations to determine the allowable leakage for the test sections.

Exfiltration Test (Using Water):

On completion of a section of sanitary sewer between manholes or otherwise, the Engineer shall require the ends of all pipe be plugged, including service connections, and the pipe subjected to a hydrostatic pressure test. Generally all testing is to be conducted after back-filling, prior to resurfacing and after service connections are made to new main.

A minimum head of six feet (6’) of water above the crown at the upper end of the test section shall be maintained for a period of four (4) hours. During which time it will be presumed that full absorption of the pipe body has taken place. Thereafter for a further period of one (1) hour period, the measured loss shall not exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.

The above listed leakage rate shall also be applied to infiltration from ground water. Infiltration or exfiltration in greater amounts will be cause for rejection of the sanitary sewer. All repairs necessary to meet these requirements and re-testing shall be at the expense of the Contractor.

The maximum length of sanitary sewer for the above allowable leakage test shall be one thousand feet (1,000’). If it is not apparent that leakage test results are satisfactory, then the Engineer may require subsequent tests to establish the more exact location of the leakage areas. Any section of sanitary sewer between any two (2) manholes that does not meet the above requirements shall be rejected and the Contractor, at his expense, shall make the necessary repairs to the sanitary sewer to meet the requirements, and shall make subsequent tests after repairs to assure compliance with the specifications.

Exfiltration Test (Using Air):

The Contractor shall furnish all facilities and personnel for conducting the test under the observation of the Engineer. The equipment and personnel shall be subject to the approval of the Engineer.

The Contractor may desire to make an air test prior to back-filling for his own purpose. However, the acceptance air test shall be made after back-filling has been completed and compacted. Generally all testing is to be conducted after back-filling, prior to resurfacing and after service connections are made to new main.

Immediately following the pipe cleaning, the pipe installation shall be tested with low pressure air. Air is to be slowly supplied to the test section until the internal air pressure reaches four pounds per square inch (4.0 psi). Where the groundwater table is above the sewer test section, the air test pressure is to be increased by the head of ground water above the lowest invert of the test section to a maximum test pressure of nine (9.0) psi. A conversion of 0.43 psi/ft of head is to be used to convert head pressure to psi. At least two (2) minutes will be allowed for temperature stabilization before proceeding further.

When the temperatures have been equalized and the pressure stabilized at 4.0 psi plus the ground water pressure increase, the air supply shall be disconnected. Contractor shall reduce the pressure to 3.5 psi plus the ground water pressure increase. Upon reaching the test pressure, the Inspector is to begin timing with a stopwatch.

If the pressure drops 1.0 psi before time expires as found in the table below then the section undergoing testing has failed and must be repaired and/or retested.

|  |  |
| --- | --- |
| Pipe Diameter | Time (Min:Sec)  100 FT |
| 4” | 0:18 |
| 6” | 0:42 |
| 8” | 1:12 |
| 10” | 1:30 |
| 12” | 1:48 |
| 15” | 2:06 |
| 18” | 2:24 |

Pressure gauges shall be incremented in not more than one half (1/2) pound increments for accurate tests.

Safety braces shall be required to hold plugs in place and to prevent the sudden release of the compressed air. Due to the large forces that could be exerted by an escaping plug during the testing of the pipe, workmen shall not be allowed in manholes or near pipe ends in which plugs have been placed while tests are being conducted. The Contractor’s testing equipment shall be arranged in such a manner that a pressure relief device will prohibit the pressure in the pipeline from exceeding ten pounds per square inch (10 psi).

If the pipe installation fails to meet test requirements, the Contractor shall determine at his own expense the source or sources of leakage, and repair (if the extent and type of repairs proposed by the Contractor are acceptable to the Engineer) or replace all defective materials or workmanship.

The completed pipe installation shall meet the requirements of this test or the alternative water exfiltration test before being considered acceptable.

Infiltration Test:

Infiltration testing may be allowed at the Engineer’s option when the natural ground water table is six feet (6’) above the crown of the higher end of the test section. The maximum allowable limit for infiltration shall not exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.

The Contractor shall furnish all tools, equipment, and labor necessary to complete the tests and shall verify from his own observations, or preliminary tests, that each line conforms to this specification before requesting the Engineer to observe and record the actual leakage.

The Engineer may require the Contractor to repair obvious leaks even though the total length of the test section falls within the maximum allowable leakage for the test used.

Check of Line and Grade:

After back-filling and cleaning, but before final acceptance, all sections of installed line may be checked for line and grade. Excluding service connections, all size sanitary sewer mains thirty inches (30”) and smaller in diameter may be checked for line and grade by closed circuit television. A full circle of light must be seen and no pipe misplaced in line or grade on straight sewer runs. A physical inspection of the interior of all sanitary sewer line thirty inches (30”) in diameter and above will be made before acceptance. Any excess deviation in line and grade shall be corrected by the Contractor prior to final acceptance of the project.

**626-3.04 CONNECTIONS TO EXISTING MANHOLES**. Connection to existing manholes shall be made in a workmanlike manner, shall be tight and have smooth flow surfaces and curves. Connections to existing sanitary sewer manholes will be allowed only after all portions of the Contractor’s work tributary to the connection point has been cleaned and flushed, inspected, and tested.

Prior to connecting to the existing manhole, the Contractor is to excavate existing manhole to clean and prepare the exterior surface. The downstream pipe in the manhole must be screened to prevent entry of mortar or other debris from entering the system. Upstream manhole inverts are to be cleaned prior to the removal of the downstream screen. At no additional cost to the Owner, the Contractor may elect to install a sewer by-pass system.

Connection to existing manhole are to be made by saw-cutting the existing sewer pipe as required to remove existing connection and install new sewer pipe to the invert elevations shown on the plans.

Existing manhole grouted inverts and flow lines shall be chipped out to accommodate the new piping. Any damage to existing manhole structure will be cause for replacement of all damaged components of the manhole at no additional cost to the Owner.

Pipes are to be inserted into the manhole through the boots such that at least two inches (2”) but no more than three (3”) of pipe extend past the inside face of the manhole.

Prior to placing grout, coat the entire perimeter contact surface of the wall opening with Sika Chemical Company SIKADUR HI-MOD, SONOBOND, or approved equal moisture insensitive epoxy bonding compound. The epoxy bonding compound must be tacky at the time grout is placed against it. Brushing over the original coating can restore tackiness.

Grout holes around new pipe in wall opening with Master Builders MASTERFLOW 713, SONOGROUT, or approved equal non-shrink grout mixed to a damp packing or ramming consistency. Temporary backing or forming may be required for ramming grout material in place around the pipe. Place grout until flush with outside face of wall.

Modification of the existing flow channel includes all work to modify and remove the existing flow channel concrete and forming new flow channels.

**626-3.05 SANITARY SEWER CLEANOUTS**. Sanitary sewer cleanouts shall be constructed according to the plans and conform to the requirements of AWWA C-151, for Class 50 ductile iron pipe and AWWA C104 / ANSI A21.4 fittings.

**626-3.06 SANITARY SEWER SERVICES & CONNECTIONS.** Sanitary sewer services shall be constructed to lines and grades shown on plans.

Insulate sanitary sewer services according to plans. Insulation shall be placed no closer than six inches (6”) above the pipe.

Construction shall be in accordance with the plans. Multiple connections to the sewer main shall not be made any closer together than three feet (3’). The terminus of the house connection shall be sealed with a suitable stopper. Taps, where allowed for installation of saddles on to sewer pipes, shall be made with a mechanical hole cutter.

Tee and wye saddles will be allowed on mains twelve inches (12”) and larger. Tee saddles will be the only saddles allowed on mains smaller than twelve inches (12”). Saddles shall be placed over a hole sawed no larger than one-eighth inch (1/8”) larger than the inside diameter of the service line. The strap(s) shall be tightened in accordance with the manufacturer’s instructions and centered over the hole sawed in the pipe being tapped. The hole shall be made above the spring line of the main being tapped.

Minimum Slopes per pipe size shall be as follows:

4” 2.08% 0.0208 feet per foot (1/4” per foot)

6” 1.00% 0.0100 feet per foot

8” 0.40% 0.0040 feet per foot

10” 0.28% 0.0028 feet per foot

12” 0.22% 0.0022 feet per foot

**626-3.07 SANITARY SEWER FLOW CONTROL.** Sanitary sewer flow control is to be completed such that it will not damage public or private property. Contractor will provide all labor, equipment, materials, planning, coordination, operations, permits, and facilities to control sewer flow for inspection, maintenance, repair or replacement of COH sewer assets.

Repair and reparations for property damage associated with the sanitary sewer flow control is the sole responsibility of the Contractor to fix, repair, clean, and make whole. This includes payment of fines and penalties levied by agencies such as the Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), or other governing bodies for unauthorized discharges of sewer.

The Contractor is to prepare, submit and receive acceptance of a detailed sewer flow control plan that describes the measures to be used to control flows prior to implementation of such plans. The plan, at minimum, is to contain the following items:

* Plug types, and sizes.
* Pump types, sizes, and power source.
* Conduit types, sizes, connections, valves and fittings.
* Name and telephone number of the Sewer Flow Control Supervisor, who is responsible for Flow Control.
* Key Personnel being used for 24-hour operations.
* Copy of noise permit application and approved permit when it is received.
* Diagram(s) indicating pump, pipes, catch points, portable restrooms and discharge point showing applicable elevations.
* Identification of structures with basements.
* Diagram and state location of provisions being made for vehicular and pedestrian traffic. Provide details of ramps, trenches, temporary surfaces, etc.
* Calculations used to size system.
* Provisions for repair and re-instatement of the sanitary sewer flow control system, including but not limited to back up pumps, repair clamps, extra hosing/piping and alternate power sources.

Unless the anticipated flow is provided in the special provisions, the Contractor is to assume that the sewer flow is to be equivalent to the capacity of the sewer system being bypassed based on the as-built information. As-built information can be obtained from the City of Homer Public Works at (907) 235-3170. When flows are bypassed, the discharge must be to a sanitary sewer collection system.

The Contractor is to provide notice to affected parties who may be impacted by planned sewer flow control. The Contractor must transition to/from sewer flow bypass systems within a six hour window of time. The Contractor, at a minimum, is to provide periodic monitoring and observations of any active sewer flow control. The maximum period between observations is limited to two hours and is to be recorded in a log book that is available to the Engineer. In addition to having the bypass system monitored, the Contractor is to provide to the Engineer and on all notices for temporary service, the name and 24-hour contact number for the person(s) responsible for continuous operation of the bypass system. This person is to be known as the Sewer Flow Control Supervisor. After approval of the sewer flow control plan, any substitutions of the Sewer Flow Control Supervisor is to be approved by the Engineer and new notices are to be sent out to sewer customers previously notified. The Contractor is to provide a sewer flow control plan to the Engineer, showing all components of the sewer flow control equipment, materials, location personnel and schedule.

Conduit and pipes:

Provide water tight hoses, piping and fittings of sufficient capacity and pressure rating to accomplish the sewer bypass. The Contractor is to have replacement conduit and fittings on-site to make multiple repairs to the conduit. Where hoses are provided, the Contractor is to have on hand two sections of replacement hose that are capable of covering the longest single hose in the flow control system. The conduit, pipe, repair and transition materials are to be of a common size and material that purveyors of such materials will have a ready supply as a backup to the on-site replacement conduit.

Conduits are to be constructed leak and repair band free. Repair bands may be used after the flow control system has been accepted for operation. Insertion of the conduit into the sewer collection system is to be done such that the system is not damaged. New penetrations for bypass conduits into the piping of the sewer collection system is not allowed except where the connection is to made into pipes being removed by the project. Sewage will not be allowed to free flow in gutters, streets, streams or over sidewalks, etc., nor is any sewage allowed to flow into storm inlets or storm water piping. Where conduits pass over traveled ways, the conduit is to be protected from vehicular and pedestrian traffic and vice versa.

Pumping and Suction Equipment:

Pumps are to be adequately sized, well maintained and of an appropriate type for sewer. They are to be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system and are to allow dry run for longer periods of time to accommodate the cyclical nature of sewer flow.

Pumps with engines or associated combustion power generation units must be in compliance with the COH noise ordinance. The Contractor is to apply for and receive a noise permit when required by the COH noise ordinance.

All pumps used to bypass mainlines and services six inches (6”) and larger are to have a reliable standby pump of equal capacity to the primary bypass pump. These backup pumps are to be on-line and isolated from the primary system through the use of valves. All bypass pumps for services smaller than six inches (6”) in size are to have a primary pump and a backup for each lot of five operationally identical primary pumps. Backup pumps are to be on-site and ready for replacement and incorporation into the by-pass system.

Plugs:

All sewer line plugs are to be permanently marked with a Contractor identification marker. Secure plugs with a tag line. The tag line is to extend and be secured to a point outside of the manhole or wet well in which it is being used. Airlines are not considered tag lines. Temporary plugs must be removed and the flow restored after planned interruptions. If the sewer flow control work has not been completed prior to the end of the planned interruption, the Contractor is then required to restore sewer flow by providing, operating and maintaining a sewer bypass until sewer flow is restored to normal.

When plugs are inserted to control the flow, the Contractor is to monitor upstream components of the services and sewer collection system. After the Work has been completed and restricting the flow is no longer needed for the work, then the flow is to be restored to normal. Flow is to be restored by removing the plugs in an order that permits flow to slowly return to normal without surcharging or causing other major disturbances downstream.

Portable Toilets:

Portable toilets are to be provided for buildings with temporarily blocked services. One portable toilet is to be provided per each two residential units or eight employees. Each business complex with a plugged sewer service is to be supplied at least one handicap accessible portable toilet with a wash station. Businesses with more than twenty four (24) employees are not eligible for portable toilet service and must have the sewer service bypass the work. Residential units housing disabled sewer customers must agree in advance and in writing to portable toilets or must have their sewer services bypass the work.

Holding Tanks:

Tanks are to be metal or plastic, free of leaks, designed to contain fluids and closed to the atmosphere except to allow for venting. Vents are to be smaller than the feed lines and installed at the highest point of the system. The tank size is to be no less than double the anticipated daily flow. Filling and discharging of tanks is to take place through securable ports.

Notifications and Service Disconnection:

Notification is to be given to the sewer utility, property owner(s), business manager(s), and resident(s) whose sewer service is being plugged, bypassed, or affected by the planned sewer flow control. Notices are to be provided a minimum of seventy two (72) hours to a maximum of one hundred forty-four (144) hours prior to commencement of the flow control. Notices at a minimum will require a written statement of when utility interruption will begin and end, form and/or amount of compensation for impacts, twenty four hour (24hr) emergency contacts, indemnification of the COH, signatures of both the Contractor and property owner. Where signatures cannot be obtained from the property owner after a minimum of three days of well documented attempts during the hours of 7am-8am, 12pm-1pm, and 6pm-7pm each day, the Contractor may complete the flow control Work within permitted Rights-of-Ways and easements. Work on private property may not commence without permission from the property owner.

Services are to be disconnected preferably at the property line or intercepted with a vacuum at the exterior structure cleanout for all rehabilitation work. All work on property requires the Contractor to obtain written permission from the property owner. Disconnected and intercepted sewer service flows are to be captured, collected and transferred to the sewer collection system downstream of the work.

The Contractor is to restore all disconnected services unless it is in the Contract to abandon the sewer service. Alternatively the Contractor may request permission from businesses, property owner(s) and primary resident(s) of single family and duplex structures for permission to block the service during the work or find alternative accommodations for residences.

**626-4.01 METHOD OF MEASUREMENT.**

1. Sanitary Sewer Conduit. By Length, along the slope of the pipe, from center to center of fittings and manholes/cleanouts. Not deduction in length will be made for valves and fittings.
2. Sewer Service Connection. By number of sewer services connected to a sewer main or to an existing sewer service.
3. Sanitary Sewer Cleanouts. By number of cleanout type.

**626-5.01 BASIS OF PAYMENT.**

Branch connections and service fittings are subsidiary.

Excavation, bedding, and backfill are paid under Section 204.

All testing of the sewer system shall be considered a subsidiary obligation under contract and extra payment will not be allowed for this portion of work. All work necessary to complete the requirements described in section 3.07 Sanitary Sewer Flow Control is subsidiary.

Connections to sewer manholes shall be paid for under Pay Item 604(3) Reconstruction of Manhole.

Pipe encasement shall not be paid for directly. Furnishing equipment, labor, tools, and incidentals to complete pipe casings in place, as shown on the plans, is subsidiary to the casing pipe. All spacers, bands, seals, and control density fill are subsidiary.

Payment will be made under:

Pay Item No. Pay Item Pay Units

626(1) Sanitary Sewer Conduit, \_\_ Inch, DIP Type Linear Foot

626(2) Sanitary Sewer Service Connection Each

626(3) Sanitary Sewer Cleanout, \_\_ Inch, Type Each

626(4) Sanitary Sewer Drop Cleanout, \_\_ Inch, Type Each

626(5) Sanitary Sewer Conduit \_\_ Inch, HDPE Type Linear Foot

626(6) Sanitary Sewer Arctic Conduit \_\_ Inch, DIP Type Linear Foot

Z524610000

Special Provisions

Replace Section 627 with the following:

SECTION 627  
WATER SYSTEM

**627-1.01 DESCRIPTION.** Construct or reconstruct water mains and services,   
including all appurtenances, as shown on the Plans or specified in this Section. Remove, salvage   
and reinstall or abandon existing water mains, services, fire hydrants, valve boxes, corporation valves, curb valves and water meters, as specified.

Coordinate with the Engineer and the City of Homer (COH); and participate in a pre-construction condition inspection, and a post-construction condition inspection of the water system facilities.

The inspections may identify main valve boxes, key boxes, the top section, the lid and additional items, to be replaced or adjusted. Replace or adjust additional facility items as directed by the Engineer.

**627-2.01 MATERIALS.** Use materials that conform to the following:

Bedding and Backfill Subsection 204-2.01

Concrete for Thrust Blocks/Plugs Subsection 550, Class W

HDPE Pipe/Sleeve Subsection 706-2.08

Arctic HDPE Pipe Subsection 706-2.08

Ductile Iron Pipe Subsection 707-2.05

Service Pipe Subsection 707-2.06

Corporation/Curb Stops Subsection 712-2.09

Gate Valves Subsection 712-2.10

Valve Boxes Subsection 712-2.11

Hydrants Subsection 712-2.12

All water system materials proposed for direct contact with water shall be certified by an ANSI accredited organization (e.g. NSF International, UL, CSA, WQA, etc.) to ANSI/NSF Standard 61 or an ANSI/NSF standard with equivalent materials health effects evaluation.

All water system materials shall be lead-free as required by Alaska Administrative Code 18 AAC 80.500. Solder and flux is lead free-free if it contains not more than 0.2 percent lead. Pipes, pipe fittings, plumbing fittings, and fixtures are lead-free if the maximum lead content is not more than a weighted average of 0.25 percent lead with respect to wetted surfaces of the water system materials.

**CONSTRUCTION REQUIREMENTS**

**627-3.01 GENERAL.** Complete the water system and make sure it operates properly at the time of acceptance of the work. Furnish and install all incidental parts not shown on the Plans or specified in this Section that are necessary to complete the water system.

Meet the applicable provisions of Sections 201, 202, 204, 603, 635 for all clearing and grubbing, removal, excavation, bedding, backfill, conduit, appurtenances, and insulation.

Consult the Plans for estimated locations of existing sewers, water mains, and other utilities near   
the construction. Use this data for information only. The Department does not guarantee their   
accuracy. Confirm and mark the exact locations of all existing utilities before starting work.

Excavate, bore, or probe by hand ahead of your work where necessary to determine the exact location of underground conduit or other features that might interfere with construction. Support and protect conduits or other services that cross the trench. Immediately repair or replace any existing utilities that you break or damage. Immediately replace any existing valves, valve boxes, or water lines that you break or damage.

Notify the local Fire Department at least 24 hours before removing or interrupting service to fire   
hydrants.

Give at least 24 hours’ notice before interrupting water service to any area. Restore disrupted water service as soon as possible, or make temporary service connections. Use hoses or other suitable methods.

If the Contactor’s operations cause service interruptions, the Contractor is responsible for all damages.

Connect to existing water lines and structures, avoiding contamination of water in lines that are in   
use.

The Contractor is to stagger the joints for the water pipe such that no joint is closer than ten feet (10’) from the centerline crossing of water to sewer. In addition, where water and sewer mains and services intersect, the vertical separation between the water and sewer pipe is to be a minimum of eighteen inches (18”) between exterior pipe surfaces.

Where water mains intersect with sewer mains, the water main must be encased in a pipe, as shown on the Plans. The Contractor shall install casing pipe spacers a maximum of one foot (1’) from each side of each water pipe joint. The maximum distance between spacers is to be eight feet (8’). Casing pipe shall be water tight. The Contractor shall grout annular space between carrier pipe and casing pipe. Ends of the casing pipe shall be sealed with rubber seals and bands. Encasement of the carrier pipe, grouting, and end seals shall be completed prior to installing the water main segment intersecting with the sewer main. Grouting required for the encasement of the carrier pipe shall be done at least seven (7) days in advance of sealing the ends of the casing pipe, as to allow for adequate curing time.

The Contractor furnishes the required traffic control, including personnel to assist, while performing inspections.

The Contractor forfeits all right to assert pre-existing damage if the Contractor fails to participate in the inspections.

Install the replacement facility items as shown in the Plans.

During inspections the COH representative, the Engineer and the Contractor will observe each facility's location and condition. The Engineer will indicate the additional facility items to be replaced. The Contractor is responsible for furnishing items to be replaced.

Provide 3 days advance written notice to COH scheduling a pre-construction inspection of the facilities. Conduct this inspection before pavement removal begins. Contact the COH Director of Public Works to determine where to send the written notice, (907) 435-3124. Provide the Engineer a copy of the written notice.

Salvage the replaced valve box top sections and lids. Coordinate with, and deliver to COH the salvaged materials. Dispose of water system facility materials not wanted by COH, according to the Kenai Peninsula Borough rules and regulations.

Provide a written notice to COH scheduling a post-construction inspection of the facilities, after the paving operations are complete and 3 days in advance of the inspection.

The Contractor will lay out (in the field) the alignment and grade of work to be done under the Contract. Once laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their proper replacement. The Contractor shall be responsible for, and pay all costs for the transfer of, the control points from the reference hubs to such hubs or batter boards as required or needed for the prosecution of the work. A ground line profile will be made by the Contractor.

The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the invert of pipe, except where otherwise noted.

**627-3.02 INSTALLATION OF WATER CONDUIT.** Pipe and appurtenances shall be handled in such a manner as to insure delivery to the trench in a sound, undamaged condition. Particular care shall be taken to not damage the pipe, pipe coating or lining. Before installation, the pipe and appurtenances shall be examined by the Engineer for defects.

The pipe shall not be strung out along the shoulders of the road for long distances if it causes inconvenience to the public. The amount of pipe strung at the job site shall be at the discretion of the Engineer.

Rubber gaskets shall be stored in a cool, dark place to prevent damage from the direct rays of the sun.

Caution tape clearly indicating water will be installed two feet (2’) above and centered on the pipe.

Installation shall be in accordance with the requirements of AWWA C-600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe shall be kept plugged during the laying operation to keep the interior clean.

Remove all foreign matter from conduit interiors before lowering into the trench. Pipe and appurtenances shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other suitable equipment. Under no circumstances shall any of the pipe or appurtenances be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers or skids shall be of wood and shall have broad, flat faces to prevent damage to the pipe and coating.

The trench bottom shall be graded to provide uniform support for the pipe barrel. Water shall be kept out of the trench by pumping, if necessary, until the jointing is completed. When work is not in progress, open ends of the pipe, fittings, and valves shall be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer. At a sufficient distance, prior to encountering a known obstacle or connection into an existing pipe, the Contractor shall expose and verify the exact location of the obstacle or pipe so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench and backfilled. The connections shall be made by using special parts and/or fittings to suit actual conditions. All connections made under pressure shall be witnessed by COH personnel.

Pipe ends left for future connections shall be plugged, or capped, and anchored as shown on the drawings or as directed by the Engineer. The end of the pipe shall be marked by means of a two by four (2” x 4”) extending from the face of the pipe to three feet (3’) above finish grade. The 2” x 4” marker shall be painted white and stenciled with the word “Water” in black two inch (2”) high letters. A minimum 1/2”x 2’ piece of rebar shall be driven alongside the 2x4 and flush with the finished grade.

Use standard lengths of pipe except where fittings require short lengths or where pipe passes through a ridged structure. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe.

Concrete thrust blocks and mechanical restraints of the type shown on the standard details shall be installed where the pipe line terminates or changes alignment, utilizing a tee, cross, bend or similar fitting. Either poured-in-place or pre-cast thrust blocks are acceptable with minimum base area approved by the Engineer. If the Contractor elects to use poured-in-place thrust blocks, all pipe and fittings exposed to concrete will be double wrapped with four (4) mil polyethylene film prior to placement of the concrete.

Restrained joints may be used in lieu of thrust blocks as approved by the Engineer.

The pipe shall be so laid in the trench that after the line is completed, the bottom of the pipe conforms accurately to the grades and alignment given by the Engineer. A maximum two-tenths foot (2/10’) deviation from design elevations and alignment will be allowed. The pipe shall be generally straight to visual observation as determined by the Engineer.

Both line and grade shall be checked and recorded in a field book for each piece of pipe and appurtenances laid. The Contractor shall have instruments such as a transit and level for transferring alignment and grades from offset hubs. The Contractor shall also have in their employ a person who is qualified to use such instruments and who shall have the responsibility of placing and maintaining such construction guides. The Contractor will furnish to the Engineer a copy of the surveyor’s notes for the newly installed pipe and appurtenances.

All adjustments to line and grade shall be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer’s recommendations for the type of pipe being installed.

If the alignment requires deflection in excess of the above limitations, the Contractor shall furnish special bends to provide angular deflections within the limits allowable. Short radius curves and closures shall be formed by shorter lengths of pipe, bevels, or fabricated special segments.

The Contractor has the option of using either mechanical or push-on joints. All joints shall conform to the requirements of AWWA C-600.

The Contractor will be required to use mechanical joints on all hydrant leads. The Engineer has the option of checking any or all mechanical joints to assure proper torque as specified by the manufacturer.

Whenever flange connections are shown on the drawings, called for in the specifications, or required in the work, the flange and fittings shall conform to the requirements of AWWA C-110 for 250 pound pressure ratings.

**627-3.03 FIRE HYDRANTS.** The Contractor shall install, relocate, or adjust the hydrant assemblies in accordance with the plans. Where required, furnish and install new fire hydrant extensions and any required pipe extensions.

Hydrants shall have the interiors cleaned of all foreign matter before installation.

All fire hydrant legs shall be installed level. The fire hydrant barrel shall be installed plumb. Any adjustments to the fire hydrant traffic flange shall be made by the Contractor.

Hydrants installed, but not available for use, shall be covered with burlap and securely tied.

In lieu of valve box markers for the auxiliary gate valves, the Contractor shall paint in two inch (2”) black lettered stencils, the direction and distances, to the nearest one-tenth foot (1/10’), the distance to the valve box on the face of the fire hydrant directly below the bonnet flange.

**627-3.04 VALVES AND VALVE BOXES.** Valves and valve boxes shall be readjusted or installed as shown and detailed on the Plans.

Valves shall have the interiors cleaned of all foreign matter before installation. If the valve is at the end of the line, it shall be plugged prior to back-filling. The valve shall be inspected by the Engineer in the open and closed positions to insure that all parts are in working condition.

All valve box adjustments shall be accomplished as directed by the Engineer. Any damage to mainline valve or valve box resulting from construction shall be repaired or the damaged portion replaced at the Contractor’s expense.

Valve operator extension rods shall be installed whenever the depth to the valve operating nut exceeds thirty-six inches (36”). The costs of furnishing and installing the extension rods shall be considered incidental to the installation.

In areas where running sand is encountered, provisions shall be made to restrict the sand from entering the bottom section of the valve box.

The Contractor shall expose all valve boxes for pre-final and final inspection. After final inspection of the valves located in unpaved areas, florescent surveying flagging shall be placed directly over the valve box lid and covered with gravel to facilitate location in the future.

**627-3.05 TESTING OF WATER CONDUIT.** Prior to any tests performed, all newly installed water facilities shall be open bore flushed. The Contractor, at his option, shall perform the disinfection and hydrostatic tests in any order of sequence. The Contractor is made aware, that in the event the disinfection has been performed and repairs are made on the system in order to pass the hydrostatic test, all previous tests, including open bore flushing, shall be declared void and shall be repeated to the satisfaction of the Engineer.

Flushing:

All newly installed water facilities shall be “open bore” flushed to remove any foreign matter. “Open bore” flushing shall be accomplished prior to hydrostatic testing and disinfection at each extremity of the main, including all stub-outs and dead ends. The Contractor shall furnish, install, and remove all fittings and pipes necessary to perform the flushing, at no additional cost to the COH. Under no circumstances will open bore flushing through hydrants or reduced outlets be permitted. The use of reducers will not be allowed.

It will be the contractor’s responsibility to notify the Engineer and the COH forty-eight (48) hours in advance of any flushing operations. All flushing of newly constructed mains will be done between the hours of 8:00 a.m. and 4:00 p.m. weekdays, unless otherwise authorized by the COH. The Contractor will be responsible for any flushing costs caused by negligence through faulty workmanship, or erosion from the flushing waters.

Hydrostatic Testing:

A hydrostatic pressure test will be conducted on all newly constructed water mains, fire hydrant leads, and stub-outs, after “open bore” flushing, in the presence of COH representatives in accordance with the requirements of AWWA C-600 unless hereinafter modified.

The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the Engineer. The Contractor shall suitably valve-off or plug the outlet to the existing or previously tested water main, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the contractor shall, install corporation cocks at such points so the air can be expelled as the line is slowly filled with water.

All main valves, fire hydrant auxiliary valves, fire hydrant main valves, and plugs shall be tested. All intermediate valves within the section being tested will be closed and reopened as directed by the Engineer during the actual test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.

All hydrostatic testing will be performed through test copper. Use of fire hydrant and service connections for testing will not be allowed.

1. Metal Pipe: The hydrostatic pressure shall be one hundred pounds per square inch (100 psi) greater than static line pressure but not less than one hundred fifty pounds per square inch (150 psi) any place within the system being tested. The duration of each hydrostatic pressure test for ductile iron pipe shall be thirty (30) minutes. Pumping will be terminated and disconnected upon starting the test. The test pressure at the start of the test is to be maintained for the duration of the test period. Any loss of pressure will be considered a failed pressure test for all pipe types except HDPE.
2. Plastic Pipe: Newly installed HDPE water main is to be hydrostatically tested to the rated operating pressure of the pipe and appurtenances in two phases. The rated operating pressure of PE4710 HDPE SDR11 piping is two hundred pounds per square inch (200 psi).
   1. Phase 1 – Initial Expansion (4 hours): Pressurize the test section to the test pressure and maintain for four (4) hours. The contractor is to pump in additional test water into the pipe to maintain test pressure as the pipe expands slightly. It is not necessary to monitor the amount of water added during this phase.
   2. Phase 2 – Pressure Testing (minimum 1 hour): Immediately following the initial expansion phase the Contractor is to stop adding testing fluid and then reduce pressure by 10 psi. The reduced pressure then becomes the test pressure and is to be held within five percent (5%) for one hour and show no visible leaks to be deemed as having passed the test. The maximum test duration is eight (8) hours. If the test is not completed in the maximum duration period, then the Contractor is to depressurize the test section completely and allow it to relax for at least eight (8) hours before pressurizing the test section again.

If the pressure decreases below the required test pressure during the test period, the pipe being tested will be declared void and will require re-testing. Cracked or defective pipes, gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor’s expense. The test shall then be repeated until the results are satisfactory.

Disinfection:

Chlorine shall be used for disinfection. Chlorine shall be applied by one (1) of the following methods:

1. Liquid chlorine gas-water mixture

2. Direct chlorine gas feed

3. Calcium hypochlorite and water mixture

Calcium hypochlorite shall be comparable to commercial products known as HTH, Perchloren or Machochlor.

The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of forty to fifty parts per million (40 to 50 ppm). Application of the chlorine solution shall continue until the required dosage is evident at all extremities of the newly laid line.

Chlorine gas-water mixture shall be applied by means of a solution feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the pipe. Calcium hypochlorite shall be injected or pumped into the water main. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Hydrostatic testing of a water line containing the chlorine mixture will not be allowed.

A residual of not less than ten parts per million (10 ppm) chlorine shall be produced in all parts of the water main and retained for a minimum period of twenty-four (24) hours. After which, this residual shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. In no instance shall a water main be chlorinated before “open bore” flushing.

C**HLORINATION**

|  |  |
| --- | --- |
| Pipe Diameter | Dosage (oz.) per 100 Feet |
| 4” | 0.60 oz |
| 6” | 1.35 oz |
| 8” | 2.75 oz |
| 10” | 4.30 oz |
| 12” | 6.19 oz |
| 16” | 11.00 oz |
| 20” | 17.00 oz |

The above table is to be used as a guide for chlorinating mains by the calcium hypochlorite and water mixture method. The given dosage per one hundred feet (100’) results in a chlorine solution of forty to fifty parts per million (40 to 50 ppm).

This dosage takes into account that Contractors more frequently used granular HTM or HTH, which is sixty-five percent (65%) pure. If another chlorinating agent is used, the dosage must be adjusted. Concentrations in excess of 100 ppm will result in rejection of the disinfection test, immediate flushing of the line, and the injection of a new mixture of chlorine solution.

After completion of testing, all test and air vent copper pipe shall be removed and the corporation stop closed at the main, in the presence of the Engineer.

**627-3.06 WATER SERVICES.** Corporation stops shall be reused at water service relocations. If the existing corporation stop is damaged or in need of replacement, a new corporation stop or main valve shall be installed at a point in the service line as close to the water main supply as possible. Corporation stops shall be flare type, brass only. Iron pipe thread corporation stops shall be used for HDPE service lines

Curb stops shall be flare type brass only. Iron pipe thread curb stops shall be used for HDPE service lines. HDPE fittings shall be used for connection of the HDPE to the service valves. The curb box shall provide a clear and unobstructed access to a valve or curb stop to enable COH operation of the valve or curb stop. Curb boxes or valve boxes shall be placed and constructed as shown on the Plans.

There shall be line pressure in the main at all times service connections are being made. All service lines one and one half inches (1-1/2”) and smaller shall be constructed of seamless, soft drawn, Type K Copper, unless otherwise shown on the Plans. All two inch (2”) service connections shall be made of HDPE. Services larger than 2” shall be of ductile iron or HDPE as shown on the plans. All ductile iron pipe installations shall be flushed, hydrostatic tested, and disinfected as outlined in this section.

The Contractor shall make the service connection to the COH main water supply in a manner consistent with these specifications and the Plans. A water service shall not cross property lines or adjoining lots, unless shown otherwise on the Plans. The connections shall be inspected by the Engineer or COH representative at the time the connection is made or the excavation be exposed in its entirety for the inspection.

A water service connection will not have more than one (1) union every one hundred feet (100’) of continuous conduit that is being replaced.

Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances are encountered to the depth required for the connections. Depth for water service connections will be a minimum of seven feet (7’) below proposed finished grade. The seven foot (7’) depth below finished grade shall be maintained five feet (5’) past the footings, before the depth shall be less than seven feet (7’). Variations in depth from the depth stated above will not be grounds for additional payment. It shall be the Contractor’s responsibility to familiarize himself with depth of water mains for the project.

The portion of the right-or-way that extends from the main to the curb box will be excavated in such a manner that will allow the service connection to be installed horizontally (no slope). The Contractor shall excavate for water connections in such a manner that the excavation is ninety degrees (90°) to the street line, whenever possible.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum width will be two and one-half feet (2-1/2’) for single services).

The Contractor shall expose the mains to be tapped for distances of four feet (4’) in length. Excavation on both sides of the pipe shall be carried to the bottom of the pipe. Excess excavation below the required level shall be backfilled and compacted with sand or gravel at the Contractor’s expense as directed by the Engineer.

No water service shall be installed within a horizontal distance of ten feet (10’) from a sewer service unless approved otherwise by the Engineer.

The Contractor shall be responsible for, and shall bear the expenses incurred, in the event that a main should be damaged during excavation or back-filling. The COH will be notified immediately of any damage and will provide oversight of the repair. The COH will provide personnel for operation of all gate valves and may provide personnel and/or equipment necessary for the repair. The Contractor shall bear the cost of all materials, labor and other expenses incurred by the repair.

All on-property installations shall be constructed to the same standard as off-property installations.

Trench backfill shall commence only after the water service lines and appurtenances have been properly completed and inspected. The backfill material, free from large clods or stones, shall be placed by the Contractor in conformance with Section 204.

The Contractor shall exercise due care in back-filling to keep the service box and thaw wire vertical and in place. In the event the service box or thaw wire is displaced, the Contractor will be required to excavate and restore the service box and thaw wire to the proper position. Any work necessary to restore the service box and thaw wire to the proper position will be performed at the Contractor’s expense.

Backfill shall not be placed in frozen trenches.

A plastic or rubber coated #2 copper thaw wire shall be attached to the corporation stop on three-fourth inch (3/4”) and one inch (1”) corporation stops by an approved method. On one and one-half inch (1-1/2”) and two inch (2”) connections, the thaw wire shall be attached to the saddle on the main.

All 3/4” through 2” water service lines, fittings, and connections will be inspected for leaks under system pressure prior to backfilling. All water service lines larger than 2” shall undergo the requirements for Flushing, Hydrostatic Testing, and Disinfection according to these specifications.

**627-4.01 METHOD OF MEASUREMENT.**

1. Water Conduit. By the length, along the slope of the conduit, from center to center of fittings and valves, and center of tee in main to center of fire hydrant gate valve. No deduction in length with be made for valves and fittings.
2. Fire Hydrant Adjustment. By the number of hydrants adjusted only for grades.
3. Fire Hydrant Installation, Relocation, or Removal. By the number of fire hydrant installed, relocated, or removed.
4. Water Service Connection. By the number of water services connected to a water main or to an existing water service.
5. Gate Valves and Valve Boxes. By the number of valves and valve boxes adjusted or installed.

**627-5.01 BASIS OF PAYMENT.**

Barrel extensions for fire hydrant adjustment are subsidiary.

The contract prices for Fire Hydrant Installation, Relocation, and Removal include the tee in the main, auxiliary gate valve with service box, conduit between the fire hydrant and the gate valve and all fittings and materials required. If no item for water conduit exists, then all conduit removal or installation required between the main and the auxiliary gate valve is subsidiary

The contract price for Water Service Connection includes installation of a curb stop, valve box, thaw wire or heat trace, and connection to a new or existing water main or water service with a service saddle, tapped coupling or corporation stop, as shown on the Plans.

Pay Item 627(10A) includes full compensation for labor, equipment, and incidental materials for installation, complete-in-place after final paving as accepted by the Engineer, including but not limited to:

• Inspections

• Adjusting the facility item down prior to the planing operation

• Adjusting the facility item up prior to the paving operation

Repairs to facilities damaged or rendered inoperable, after the pre-construction inspection and before the final inspection, are the responsibility of the Contractor and no additional payment will be made.

All traffic control required for the inspections will be paid under the 643 Pay Items.

Excavation, bedding, and backfill are paid under Section 204.

Clearing and grubbing, landscaping, disinfection, testing, couplings and/or thrust blocks are subsidiary.

Any costs involved in service changeovers and providing temporary water service are subsidiary.

Pipe encasement shall not be paid for directly. Furnishing equipment, labor, tools, and incidentals to complete pipe casings in place, as shown on the plans, is subsidiary to the casing pipe. All spacers, bands, seals, and control density fill are subsidiary.

Payment will be made under:

Pay Item No. Pay Item Pay Units

627(1) Ductile Iron Water Conduit, \_\_ Inch, Type Linear Foot

627(2) \_\_ Inch, Steel Water Conduit, Type Linear Foot

627(3) Install Valve Box Each

627(4) Fire Hydrant Adjustment Each

627(5) Fire Hydrant Installation Each

627(6) Fire Hydrant Relocation Each

627(7) Fire Hydrant Removal Each

627(8) Water Service Connection Each

627(9) Gate Valve, \_\_ Inch Each

627(10) Adjustment of Valve Box Each

627(10A) Adjustment of Key Box Each

627(11) Copper Water Conduit, \_\_ Inch, Type Linear Foot

627(12) HDPE Water Conduit, \_\_ Inch, Type Linear Foot

627(13) HDPE Water Conduit - Arctic, \_\_ Inch, Type Linear Foot

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Special Provisions

Replace Section 630 with the following:

SECTION 630  
GEOTEXTILE FOR EMBANKMENT AND ROADWAY  
SEPARATION, STABILIZATION AND REINFORCEMENT

**630-1.01 DESCRIPTION.** Prepare ground surface, and furnish and place geotextiles for separation, stabilization, and/or reinforcement as shown on the Plans.

**630-2.01 MATERIALS.** Use materials that conform to the following:

Geotextiles and Sewn Seam Strength Subsection 729-2.01

Sewing Thread. Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

**630-3.01 CONSTRUCTION.**

1. Surface Preparation. Prepare ground surface by removing 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.

2. Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Do not drag the geotextile through mud or over sharp objects that could damage the geotextile. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextiles to get wet prior to installation.

a. Separation and Stabilization. Lay geotextile for embankment separation and stabilization parallel to roadway centerline. On horizontal curves, place in segment lengths not exceeding those listed in Table 630-1, with butt ends cut to match and sewn or overlapped. On tangents, straighten the geotextile and sew or overlap butt ends. Shingle overlaps in the same direction as fill placement. Prevent overlapped edges from lifting during construction.

b. Reinforcement. Lay the machine direction of the geotextile, for embankment reinforcement, perpendicular to the roadway centerline or as shown on the Plans. Join segments by sewing or an approved bonding or attachment process. Shingle overlaps in the same direction as fill placement if seams are not sewn. Prevent overlapped edges from lifting during construction.

**TABLE 630-1**

**GEOTEXTILE PLACEMENT ON CURVES**

|  |  |
| --- | --- |
| **Degree of Curve** | **Maximum Segment Length (ft.)** |
| 1 | 125 |
| 2 | 90 |
| 3 | 75 |
| 4 | 65 |
| 5 | 55 |
| 6 | 50 |

3. Joining. Join adjacent geotextiles for separation or stabilization by overlapping or sewing. Join adjacent geotextiles for reinforcement by sewing or as shown on the Plans. Other attachment methods may be used if approved by the Engineer.

a. Sew seams with a Butterfly or J-Seam. Use a double-thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1 1/4-inches (± 1/4-inch) from the folded edge of the seam and at least 1/2-inch from the free edge of the geotextile. Sew seams so that they face upward and can be easily inspected by the Engineer. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines,* FHWA-NHI-07-092, August 2008.

b. Overlap geotextile sections by a minimum of 3-feet at all longitudinal and transverse joints. Place the beginning of each new roll beneath the end of the previous roll to prevent the advancing fill from lifting the geotextile. Shingle in the direction of construction.

4. Material Placing and Spreading. Place embankment material closely following fabric laydown to avoid fabric displacement and exposure. During placing and spreading of material, maintain a minimum depth of 12-inches of cover material; or a minimum depth equal to the separation distance between multiple layers of geotextile as shown on the Plans when this separation distance is less than 12-inches; at all times between the geotextile and the wheels or tracks of construction equipment. Limit the size and weight of construction equipment to reduce rutting in the initial lift above the geotextile to not greater than 3-inches deep to prevent overstressing the geotextile.

Spread the material in the direction of the upper overlapped geotextile. Maintain proper overlap and geotextile continuity. If sewn or bonded seams are used, place the cover material and spread in only one direction for the entire length of the geotextile. On weak subgrades limit height of dumped cover material to prevent localized subgrade and/or geotextile failure. Do not drop stones or frozen material larger than 1-foot in diameter directly onto the geotextile from a height of more than 1-foot.

Compact using a smooth drum roller or in a manner approved the Engineer. Do not allow construction equipment to make sudden stops and starts on the cover material. Do not allow turning of vehicles on the initial lift of cover material above the geotextile. Fill any ruts over 3-inches deep occurring during construction with additional material shown on the Plans; do not grade adjacent material into rut. Compact rut fill material to the specified density.

5. Geotextile Repair. Should the geotextile be torn, punctured, or the overlaps or sewn joints disturbed – as evidenced by visible geotextile damage, subgrade pumping, intrusion, or embankment distortion – remove the backfill around and under (if required by the Engineer) the damaged or displaced area and repair or replace the damaged area. Make repairs to the damaged area with a patch of the same type and class of geotextile originally placed. Make patches overlap by a minimum of 3-feet or sew patches to the existing geotextile, as specified for joining of the same type and class of geotextile, unless otherwise directed by the Engineer.

a. Separation and Stabilization. Overlay torn area with geotextile with a minimum 3-feet overlap around the edges of the torn or damaged area or sew and bond according to Subsection 630-3.01.3.a. Ensure the patch remains in place when cover material is placed over the affected area.

b. Reinforcement. Sew according to Subsection 630-3.01.3.a unless joining by overlap is shown on the Plans. Ensure the patch remains in place when cover material is placed over the affected area.

**630-4.01 METHOD OF MEASUREMENT.** Measure geotextile by the square yard of ground surface covered. No allowance will be made for overlap, whether at joints or patches.

**630-5.01 BASIS OF PAYMENT.** Payment will be at the Contract unit price. Repair and replacement costs for damaged geotextile are subsidiary to the Section 630 Pay Items.

Material used to fill ruts and holes will be paid for at the unit price for the type of material used.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

630(1) Geotextile, Separation, Class 3 Square Yard

630(2) Geotextile, Stabilization, Class 1 Square Yard

630(3A) Geotextile, Reinforcement – Type 1 Square Yard

630(3B) Geotextile, Reinforcement – Type 2 Square Yard

CR630-070115

Special Provisions

Replace Section 633 with the following:

SECTION 633  
SILT FENCE

**633-1.01 DESCRIPTION.** Furnish, install, maintain, and remove temporary silt fence as shown on the Plans or as directed by the Engineer.

**633-2.01 MATERIALS.** Use materials that conform to the following:

Geotextile Subsection 729-2.01

Silt Fence Subsection 729-2.04

Posts Wood 1.5-inch x 1.5-inch x 36-inch min., steel, or approved synthetic material.

Prefabricated Silt Fence Meet the Plans and Section 633 requirements.

Attachment Devices Staples; wire; self-locking nylon, plastic or wire ties; or other approved means to attach fabric to posts.

Support Mesh between Posts 14-guage welded wire fencing, metal chain-link fabric, or geosynthetic mesh with equivalent strength. Use maximum mesh spacing of 6 inches. Height shown on the Plans, or specified in the Bid Schedule.

**633-3.01 CONSTRUCTION.** Install silt fence according to Plans. Use Trenchless Detail when installing silt fence over permanently frozen ground. Holes may need to be predrilled for support posts. When joining to another roll, place both end posts together and wrap them with silt fence by turning them one full rotation. Drive the wrapped posts.

**633-3.02 MAINTENANCE.** Maintain the integrity of the fence to contain sediment in runoff until final stabilization.

**633-3.04 REMOVAL.** After disturbed area has been accepted as permanently stabilized or when sediment protection is no longer needed, remove silt fence according to the Plans.

**633-4.01 METHOD OF MEASUREMENT.** Section 109. Measure silt fence by the length of fence installed. No allowance will be made for overlap, whether at joints or patches.

**633-5.01 BASIS OF PAYMENT.** The contract price includes installation, maintenance, removal and disposal of the fence.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

633(1) Silt Fence Linear Foot

633(2) Support Mesh Reinforced Silt Fence Linear Foot

CR633-070115

SECTION 635  
INSULATION BOARD

Special Provisions

Replace Subsection 635-4.01 with the following:

**635-4.01 METHOD OF MEASUREMENT.**

Section 109.

Sand blanket and bedding material are subsidiary to Insulation Board.

Any additional excavation and backfill required for the installation of Insulation Board, not associated with 603, 604, 610, 611, 626, or 627 pay items, is subsidiary.

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Special Provisions

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.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

639(1) Residence Driveway Each

639(2) Commercial Driveway Each

639(3) Public Approach Each

639(4) Driveway Each

639(6) Approach Each

CR639-092016

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 APDES Construction General Permit. The state APDES program is administered by DEC. Section 301(a) of the Clean Water Act (CWA) and 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except as allowed by the CGP.

**641-1.02 DEFINITIONS.** These definitions apply only to Section 641.

**ACTIVE TREATMENT SYSTEM (ATS) OPERATOR.** The Contractor’s qualified representative who is responsible for maintaining and operating an active treatment system (as defined in the CGP) for storm water runoff.

**ALASKA CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (AK-CESCL).** A person who has completed training, testing, and other requirements of, and is currently certified as, an AK-CESCL from an AK-CESCL Training Program (a program developed under a Memorandum of Understanding between the Department and others). The Department recognizes AK-CESCLs as “qualified personnel” required by the CGP. An AK-CESCL must be recertified every three years. (See Qualified Person)

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC).** The state agency authorized by EPA to administer the Clean Water Act’s National Pollutant Discharge Elimination System.

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

**BEST MANAGEMENT PRACTICES (BMPS).** Temporary or permanent structural and non-structural devices, schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or minimize the discharge of pollutants to waters of the United States. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from material storage.

**CLEAN WATER ACT (CWA).** Federal Water Pollution Control Amendments of 1972, as amended (33 U.S.C. 1251 et seq.).

**CONSTRUCTION ACTIVITY.** Physical activity by the Contractor, Subcontractor or utility company; that may result in erosion, sedimentation, or a discharge of pollutants into storm water. Construction Activity includes soil disturbing activities (e.g. clearing, grubbing, grading, excavating); and establishment of construction materials or equipment storage or maintenance areas (e.g. material piles, borrow area, concrete truck chute wash-down, fueling); and industrial activities that may discharge storm water and are directly related to the construction process (e.g. concrete or asphalt batch plants).

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

**CORPS OF ENGINEERS PERMIT (COE PERMIT).** A U.S. Army Corps of Engineers Permit for construction in waters of the US. Such permit may be issued under Section 10 of the Rivers and Harbors Act of 1899, or Section 404 of the Clean Water Act.

**ELECTRONIC NOTICE OF INTENT (ENOI).** The electronic Notice of Intent submitted to DEC, to obtain coverage under the CGP.

**ELECTRONIC NOTICE OF TERMINATION (ENOT).** The electronic Notice of Termination submitted to DEC, to end coverage under the CGP.

**ENVIRONMENTAL PROTECTION AGENCY (EPA).** A federal agency charged to protect human health and the environment.

**ERODIBLE STOCKPILE.** Any material storage area or stockpile consisting of mineral aggregate, organic material, or a combination thereof, with greater than 5 percent passing the #200 sieve, and any material storage where wind or water transports sediments or other pollutants from the stockpile. Erodible Stockpile also includes any material storage area or stockpile where the Engineer determines there is potential for wind or water transport of sediments or other pollutants away from the stockpile.

**EROSION AND SEDIMENT CONTROL PLAN (ESCP).** The Department’s project specific document that illustrates measures to control erosion and sediment on the project. The ESCP provides bidders with the basis for cost estimating and guidance for developing an acceptable Storm Water Pollutant Prevention Plan (SWPPP).

**FINAL STABILIZATION.** Is defined in this section as it is defined in the CGP, Appendix C.

**HAZARDOUS MATERIAL CONTROL PLAN (HMCP).** The Contractor's detailed project specific plan for prevention of pollution from storage, use, transfer, containment, cleanup, and disposal of hazardous material (including, but are not limited to, petroleum products related to construction activities and equipment). The HMCP is included as an appendix to the SWPPP.

**INSPECTION.** An inspection required by the CGP or the SWPPP, usually performed together by the Contractor’s SWPPP Manager and Department’s Storm Water Inspector.

**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. See CGP for further definition.

**MULTI-SECTOR GENERAL PERMIT (MSGP).** The Alaska Pollutant Discharge Elimination System General Permit for storm water discharges associated with industrial activity.

**LOW-ERODIBLE STOCKPILE.** Any material stockpile identified in the CGP definition for Final Stabilization Section 1.b, and includes: riprap, gabion backfill, porous backfill, railroad ballast, and sub-ballast, ditch lining, or fill material with low erodibility. The stockpile shall not have a gradation of more than 5 percent passing the #200 sieve unless approved by an Engineer. There shall be no possibility of sediment transport due to water or wind erosion.

**OPERATOR(S).** The party or co-parties associated with a regulated activity that has responsibility to obtain permit coverage under the CGP. ”Operator” for the purpose of the CGP and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

2. The party has day to day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g. they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

**POLLUTANT.** Any substance or item meeting the definition of pollutant contained in 40 CFR § 122.2. A partial listing from this definition includes: dredged spoil, solid waste, sediment, sewage, garbage, sewage sludge, chemical wastes, biological materials, wrecked or discarded equipment, rock, sand, cellar dirt and industrial or municipal waste.

**PROJECT ZONE.** The physical area provided by the Department for Construction. The Project Zone includes the area of highway or facility under construction, project staging and equipment areas, and material and disposal sites; when those areas, routes and sites, are provided by the Contract.

Material sites, material processing sites, disposal sites, haul routes, staging and equipment storage areas; that are furnished by the Contractor or a commercial operator, are not included in the Project Zone.

**QUALIFIED PERSON.** A person knowledgeable in the principles and practice of erosion and sediment controls. A qualified Person must be certified under the Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) training program. One of the following training and certification programs may substitute for AK-CESCL certification: CPESC, CESSWI, CPSWQ, OR CISEC (CGP, Appendix C).

**RECORDS.** Any record, report, information, document, or photograph required to be created or maintained pursuant to the requirements of the CGP, the CGP storm water requirements of the Clean Water Act; and applicable local, state, and federal laws and regulations regarding document preservation.

**SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC PLAN).** The Contractor’s detailed plan for petroleum spill prevention and control measures that meet the requirements of 40 CFR 112.

**SPILL RESPONSE FIELD REPRESENTATIVE.** The Contractor’s representative with authority and responsibility for managing, implementing, and executing the HMCP and SPCC Plan.

**STORM EVENT.** A rainfall event that produces more than 0.5-inch of precipitation in 24 hours and that is separated from the previous storm event by at least 3 days of less than 0.1 inch of rain per day.

**STORM WATER POLLUTION PREVENTION PLAN (SWPPP).** The Contractor’s detailed project specific plan to minimize erosion and contain sediment within the Project Zone, and to prevent discharge of pollutants that exceed applicable water quality standards. The SWPPP includes, but is not limited to, amendments, records of activities, inspection schedules, and reports, qualifications of key personnel, and all other documentation, required by the CGP and this specification, and other applicable local, state, and federal laws and regulations.

**STORM WATER POLLUTION PREVENTION PLAN TWO (SWPPP2).** The Contractor’s detailed project specific plan to comply with CGP or MSGP requirements, for Contractor construction-related activities outside the Project Zone.

**SUBCONTRACTOR SPILL RESPONSE COORDINATOR.** The subcontractor’s representative with authority and responsibility for coordinating the subcontractor’s activities in compliance with the HMCP and SPCC Plan.

**SUBCONTRACTOR SWPPP COORDINATOR.** The subcontractor’s representative with authority to direct the subcontractor’s work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the subcontractor’s compliance with the SWPPP.

**SUPERINTENDENT.** The Contractor’s duly authorized representative in responsible charge of the work. The Superintendent has responsibility and authority for the overall operation of the Project and for Contractor furnished sites and facilities directly related to the Project.

**SWPPP AMENDMENT.** A revision or document that adds to, deletes from, or modifies the SWPPP.

**SWPPP MANAGER.** The Contractor’s qualified representative who conducts Inspections, updates SWPPP records, and has authority to suspend work and to implement corrective actions required for CGP compliance.

**SWPPP PREPARER.** The Contractor’s qualified representative who is responsible for developing the initial SWPPP.

**TEMPORARY STABILIZATION.** Protecting soils from erosion and sediment loss by rainfall, snow melt, runoff, or wind with a temporary vegetative and/or non-vegetative protection cover. Temporary stabilization may include a combination of seeding, geotextiles, mulches, surface tackifiers, rolled erosion control products, low-erodible gravel or paving, or the mentioned BMP's combined together with trackwalking.

**UTILITY SPILL RESPONSE COORDINATOR.** The Utility’s representative with authority and responsibility for coordinating the Utility’s activities in compliance with the HMCP and SPCC Plan.

**UTILITY SWPPP COORDINATOR.** The Utility’s representative with authority to direct the Utility’s work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the Utility’s compliance with the SWPPP.

**641-1.03 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 Subsection 641-1.03.

Partial and incomplete submittals will not be accepted for review. Any submittal that is re-submitted or revised after submission, but before the review is completed, will restart the submittal review timeline. No additional Contract time or additional compensation will be allowed due to delays caused by partial or incomplete submittals, or required re-submittals.

1. Storm Water Pollution Prevention Plan. Submit an electronic copy and three hard copies of the SWPPP to the Engineer for approval. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. Organize and bind the SWPPP and related documents for submittal according to the requirements of Subsection 641-2.01.2.

The Department will review the SWPPP submittals within 14 days after they are received. Submittals will be returned to the Contractor, and marked as either “rejected” with reasons listed or as “approved” by the Department. When the submittal is rejected, the Contractor must revise and resubmit the SWPPP. The 14-day review period will restart when the contractor submits an electronic copy and three hard copies of the revised SWPPP to the Engineer for approval.

After the SWPPP is approved by the Department, the Contractor must sign and certify the approved SWPPP using Form 25D-111. See Subsection 641-1.03.4 for further SWPPP submittal requirements.

2. Hazardous Material Control Plan. The HMCP Template can be found at the following webpage: <http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml>. Submit an electronic copy and three hard copies of the HMCP, as an appendix to the SWPPP, to the Engineer for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.

3. Spill Prevention, Control, and Countermeasure Plan. When a SPCC Plan is required under Subsection 641-2.03, submit an electronic copy and three signed hard copies of the SPCC Plan to the Engineer. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. The Department reserves the right to review the SPCC Plan and require modifications.

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. Use a SWPPP2 for Construction Activities outside the Project Zone.

After Department approval of the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to DEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and DEC’s written acknowledgement (by letter or other document), to the Engineer as soon as practicable and no later than 3 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. Ending CGP Coverage. Submit an eNOT to DEC within 30 days after the Engineer has determined the conditions listed in Subsection 641-3.01.6 have been met. Submit a copy of the signed eNOT and DEC’s acknowledgement letter to the Department within 3 days of filing the eNOT or receiving a written response.

6. DEC SWPPP Review. When CGP Part 2.1.3, 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 7 days of receiving the confirmation; and

c. Retain a copy of delivery receipt confirmation in the SWPPP.

7. 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 7 days of receiving the confirmation;

c. Transmit a copy of any comments by the local government to the Engineer within 7 days of receipt;

d. Amend the SWPPP as necessary to address local government comments and transmit SWPPP Amendments to the Engineer within 7 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.

8. Modifying Contractor’s eNOI. When required by the CGP Part 2.7, modify your eNOI to update or correct information within 30 calendar days of the change. Reasons for modification include a change in start or end dates, change in Owner/Operator address and contact information, change in site information, any changes in number of acres to be disturbed, change in decision to use or not use treatment chemicals, or change in location of SWPPP records.

The Contractor must submit an eNOT and then submit a new eNOI instead of an eNOI modification when: the operator has changed.

**641-1.04 PERSONNEL QUALIFICATIONS.** Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications.

1. The SWPPP Preparer.

a. Total disturbed acreage, 20 acres or less, must meet at least one of the following qualifications:

(1). Current certification as a Certified Professional in Erosion and Sediment Control (CPESC);

(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. Provide documentation including project names, project timelines, and work responsibilities demonstrating the experience requirement; or

(3). Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.

b. Total disturbed acreage greater than 20 acres, must meet Subsection 641-1.04.1.a. above, and complete a SWPPP Preparation course.

2. The Superintendent must meet the following qualifications:

a. Current certification as AK-CESCL; and

b. Duly authorized representative, as defined in the CGP, Appendix A, Part 1.12.3.

3. The SWPPP Manager must have current certification as AK-CESCL. The SWPPP Manager must meet the experience, and authority requirements identified in the CGP for the Storm Water Lead and Storm Water Inspector positions.

4. The Active treatment System (ATS) operator must have current certification as AK-CESCL, and be knowledgeable in the principles and practices of treatment systems in general, and the operation of the project-specific ATS. The ATS operator must have at least three months field experience with ATS, or completion of an ATS manufacturer’s training course, or completion of system operator certification course.

5. The Department accepts people having any of the following certificates as equivalent to AK-CESCL, if the certificates are current according to the sponsoring organization’s policies:

a. CPESC, Certified Professional in Erosion and Sediment Control; or

b. CISEC, Certified Inspector in Sediment and Erosion Control.

**641-1.05 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS.**

1. eNOI and eNOT. The eNOI and eNOT must be signed and certified by a responsible corporate officer according to CGP Appendix A, Part 1.12. Signature and certification authority for the eNOI and eNOT cannot be delegated.

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 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. Handwrite signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

**641-1.06 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.**

1. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.

2. The Contractor is responsible for permitting and permit compliance 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. Subsection 107-1.02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.

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.

3. Subsection 107-1.02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.

4. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:

a. For areas outside the Project Zone;

b. For Construction Activity and Support Activities outside the Project Zone; and

c. For commercial plants, commercial material sources, and commercial disposal sites.

**641-1.07 UTILITY.**

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

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

**641-2.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS.**

1. SWPPP Preparer and Pre-Construction Site Visit.

Use a SWPPP Preparer to develop the SWPPP and associated documents, according to the requirements of the CGP and COE permit. The SWPPP Preparer must put their name, qualifications (including the expiration date of any certifications), title and company name in the SWPPP.

The SWPPP Preparer must conduct a pre-construction inspection at the Project site before construction activity begins. If the SWPPP Preparer is not a Contractor employee, the SWPPP Preparer must visit the site accompanied by the Contractor. Give the Department at least 7 days advance notice of the site visit, so that the Department may participate.

During the pre-construction inspection, the SWPPP Preparer must identify, or if a draft of the SWPPP has already been prepared verify that the SWPPP fully addresses and describes:

a. Opportunities to phase construction activities;

b. Appropriate BMPs and their sequencing; and

c. Sediment controls that must be installed prior to beginning Construction Activities.

Document the SWPPP Preparer’s pre-construction inspection in the SWPPP on Form 25D-106, SWPPP Pre-Construction Site Visit, including the names of attendees and the date.

2. Developing the SWPPP.

Use the Department’s project ESCP, Environmental commitments, and other Contract documents as a starting point for developing the SWPPP. The approved SWPPP replaces the ESCP.

Develop the SWPPP with sections and appendices, according to the current DOT&PF SWPPP template. Include information required by the Contract and described in the CGP Part 5.0.

a. Obtain the following forms after they have been completed by the Department and include them in the SWPPP:

(1) SWPPP Delegation of Signature Authority – DOT&PF (25D-107)

(2) SWPPP Certification for DOT&PF (25D-109)

(3) SWPPP Delayed Action Item Report (25D-113), if needed

b. Use the following Department forms for recording information in the SWPPP:

(1) SWPPP Amendment Log (25D-114)

(2) SWPPP Certification for Contractor (25D-111)

(3) SWPPP Construction Site Inspection Report (25D-100)

(4) SWPPP Corrective Action Log (25D-112)

(5) SWPPP Daily Record of Rainfall (25D-115)

(6) SWPPP Delegation of Signature Authority – Contractor (25D-108)

(7) SWPPP Grading and Stabilization Activities Log (25D-110)

(8) SWPPP Pre-Construction Site Visit (25D-106)

(9) SWPPP Project Staff Tracking (25D-127)

(10) SWPPP Subcontractor Certification (25D-105)

(11) SWPPP Training Log (25D-125)

(12) SWPPP Noncompliance (25D-143)

SWPPP Template forms and instructions are available online at:

<http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml>

Compile the SWPPP in three ring binders with tabbed and labeled dividers for each section and appendix.

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, using a separate SWPPP2, and separate Contractor Inspections.

b. The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. The SWPPP must describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. The SWPPP must identify all operators for the Project, including utility companies performing Construction Activity, and identify the areas:

(1) Over which each operator has operational control; and

(2) Where the Department and Contractor are co-operators.

c. For work outside the Project Zone the SWPPP must identify the entity that has storm water permit coverage, the operator, and the areas that are:

(1) Dedicated to the Project and where the Department is not an operator; and

(2) Not dedicated to the project, but used for the project.

d. Account for the Contractor’s construction methods and phasing. Identify the amount of mean annual precipitation.

e. Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges. List locations where authorized non-storm water will be used, including the types of water that will be used on-site.

f. Include the Department’s Antidegradation Analysis in the SWPPP if storm water from the Project Zone discharges into receiving water that is considered a high quality water and that constitutes an outstanding national resource, according to CGP Part 2.1.6.

g. Where the project intersects a Public Water System (PWS), the Engineer will notify the PWS contact for the Department and Contractor according to the CGP Part 4.10. Contractor Amend a copy of the communications in Appendix Q.

h. There are special requirements in the CGP Part 3.2, for storm water discharges into an impaired water body, and they may include monitoring of storm water discharges. For Projects meeting the permit criteria, the Contractor shall implement a monitoring plan approved by the Department for the storm water within the Project Zone, and shall provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.

i. Preserve natural topsoil unless infeasible. Delineate the site according to CGP Part 4.2.1. Use stakes, flags, or silt fence, etc. to identify areas where land disturbing activities will occur and areas that will be left undisturbed. Minimize the amount of soil exposed during Construction activity according to CGP Part 4.2.2.

j. Comply with CGP Part 4.4, and the DEC General Permit for Excavation Dewatering (AKG002000), requirements for dewatering for trenches and excavations.

k. The SWPPP must identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion must be addressed. The potential for erosion at drainage structures must be addressed.

l. Describe methods and time limits, to initiate temporary or final soil stabilization, CGP Part 4.5.1.1. Begin stabilization no later than the end of the next work day, following the day when the earth-disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding:

(1) 7 days for areas with mean annual precipitation 40 inches or greater; or

(2) 14 days for areas with mean annual precipitation less than 40 inches.

Time allotted to complete temporary and final stabilization, Subsection 641-2.01, 3.m.

m. Within 7 days of initiating final stabilization, CGP Part 4.5.1.4, either complete final stabilization or continue maintenance of work until final stabilization is complete. Complete temporary stabilization within 14 days of initiating stabilization, CGP Part 4.5.1.2.

n. Include in the “Stabilize Soils” section of the SWPPP, a description of how you will minimize the amount of disturbed and unstabilized ground in the fall season. Identify anticipated dates of fall freeze-up and spring thaw. Describe how you will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Include a plan for final stabilization.

o. Plans for Active Treatment Systems must be submitted to DEC for review at least 14 days prior to use of the system and the Operator of the ATS identified in the SWPPP. Any use of treatment chemicals must be identified on the NOI, documented in the SWPPP, and meet with the requirements in the CGP Part 4.6.

p. The SWPPP must provide designated areas for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities must be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washout, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water that doesn’t contain detergent may be discharged on-site if it is treated before discharge.

q. Design temporary BMPs for a 2 year 24 hour precipitation amount. Describe BMPs in the SWPPP and in SWPPP Amendments, including source controls, sediment controls, discharge points, and temporary and final stabilization measures. Describe the design, placement, installation, and maintenance of each BMP, using words, and drawings as appropriate. Describe the design capacity of sediment basins (including sediment ponds and traps). Provide a citation to the BMP Manual or publication used as a source for the BMP, including the manufacturer's or BMP manual specifications for installation (CGP Part 5.3.6.2). If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment must state that “No BMP manual or publication was used for this design.”

r. Describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Phase earth-disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization quickly. Whenever practicable incorporate final stabilization work into excavation, embankment, and grading activities. Include drawings showing each phase of the project with the BMPs implemented in the Phase.

s. Provide a legible site map or set of maps in the SWPPP, showing the entire site and identifying boundaries of the property where construction and earth-disturbing activities will occur, as described in the CGP Part 5.3.5. Include all BMPs on the site map.

t. Identify the inspection frequency in the SWPPP:

(1) Inspect once every 7 calendar days regardless of the precipitation amount.

u. Linear Project Inspections, described in CGP Part 6.5, are not applicable to this contract.

v. 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.

w. 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 (use Form 25D-127) the names of the replacement personnel, the date of the replacement. For temporary personnel record their beginning and ending dates.

Provide 24-hour contact information for the Superintendent and SWPPP Manager. The Superintendent and SWPPP Manager must have 24-hour contact information for all Subcontractor SWPPP Coordinators and Utility SWPPP Coordinators.

Include in the SWPPP, proof of AK-CESCL, or equivalent certifications of ATS operators. Record the 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 (if applicable), and names and dates they are acting in that position. Include the Department’s staff certifications in Appendix E. Include the Department’s staff names, dates acting, and assignments, in Section 2.0 of the SWPPP.

**641-2.02 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS.**

1. Prepare the HMCP using the DOT&PF template located at the following DOT&PF link; (<http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml>) for prevention of pollution from storage, use, containment, cleanup, and disposal of all hazardous material, including petroleum products related to construction activities and equipment. Include the HMCP as an appendix to the SWPPP. Compile Material Safety Data Sheets in one location and reference that location in the HMCP.

2. Designate a Contractor’s Spill Response Field Representative with 24 hour contact information. Designate a Subcontractor Spill Response Coordinator for each subcontractor. The Superintendent and Contractor’s Spill Response Field Representative must have 24-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.

3. List and give the location and estimated quantities of hazardous materials (Including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials must be stored in covered storage areas. Include secondary containment for all hazardous material storage areas.

4. Identify the locations where fueling and maintenance activities will take place, describe the activities, and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.

5. List the types and approximate quantities of response equipment and cleanup materials available on the Project. Include a list and location map of cleanup materials, at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials must be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.

6. Describe procedures for containment and cleanup of hazardous materials. Describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills. Describe a plan for dealing with contaminated soil and water encountered during construction. Clean up spills or contaminated surfaces immediately.

7. Describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Identify haul methods and final disposal areas. Assure final disposal areas are permitted for hazardous material disposal.

8. Describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75. Include contact information for reporting hazardous materials and petroleum product spills to the Project Engineer and reporting to federal, state and local agencies.

**641-2.03 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC Plan) REQUIREMENTS.** Prepare and implement an SPCC Plan when required by 40 CFR 112; when both of the following conditions are present on the Project:

1. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and

2. Total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons)

Reference the SPCC Plan in the HMCP and SWPPP.

**641-2.04 RESPONSIBILITY AND AUTHORITY OF THE SUPERINTENDENT AND SWPPP MANAGER.**

The Superintendent is responsible for the overall operation of the Project and all Contractor furnished sites and facilities directly related to the Project. The Superintendent shall sign and certify the SWPPP, Inspection Reports, and other reports required by the CGP, except the NOI and NOT. The Superintendent may not delegate the task or responsibility of signing and certifying the SWPPP submitted under Subsection 641-1.03.1, Inspection Reports, and other reports required by the CGP.

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(7) is part of the Contract, the SWPPP Manager must be available at all times to administer SWPPP requirements, and be physically present within the Project Zone or the project office, for at least eight hours per day when construction activities are occurring.

The Superintendent and SWPPP Manager shall be knowledgeable in the requirements of this Section 641, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental commitments, and historic preservation commitments.

The Superintendent and SWPPP Manager shall have the Contractor’s complete authority and be responsible for suspending construction activities that do not conform to the SWPPP or CGP.

**641-2.05 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 temporary seed mixture specified, and if not specified as directed.

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 products manufactured in another state, country or territory. Grass, legumes, or any other herbaceous plants produced as hay, shall not be substituted for straw, or straw products.

Use Oregon Scientific RGR126 wireless rain gauge with temperature, or Taylor 2751 Digital Wireless Rain Gauge with Thermometer, or approved equivalent.

**641-3.01 CONSTRUCTION REQUIREMENTS.** Comply with the SWPPP and the requirements of the CGP Part 5.0.

1. Before Construction.

The following actions must be completed before Construction Activity begins:

a. The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP Form (25D-106), and the SWPPP must be developed (or amended) with findings from the visit;

b. The SWPPP must be approved by the Engineer on Form 25D-109;

c. The Contractor must be authorized to begin by the Engineer;

d. The Project eNOIs for the Department and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the DEC website;

e. The Department approved SWPPP must be submitted to DEC and Local Government (when required); and

f. The Contractor has transmitted to the Engineer an electronic copy, and at least one hardcopy of the approved SWPPP.

g. The Delegation of Authority (Forms 25D-108 and 25D-107) for both the Contractor and DOT&PF Engineer are signed.

h. Begin winter construction activity according to CGP Part 4.12.2, provided actions a, c, and g are completed. If winter construction activities may extend beyond spring thaw, the following actions must be completed before spring thaw:

(1) Actions a through g, listed above, and

(2) Appropriate control measures to minimize erosion and sediment runoff during spring thaw and summer rainfall are installed.

i. Post notices.

Include the following information:

(1) Copy of all eNOIs related to this project;

(2) Location of the SWPPP.

Post notices on the outside wall of the Contractor’s project office, and near the main entrances of the construction project. Protect postings from the weather. Locate postings so the public can safely read them without obstructing construction activities or the traveling public (for example, at an existing pullout). Do not use retroreflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where the signs may be confused with traffic control signs or devices. Update the notices if the listed information changes.

J. Install an outdoor rain gauge per manufacturer’s guidance in a readily accessible location on the Project. Projects may utilize the nearest National Weather Service (NWS) precipitation gauge station, if within 20 miles of the project, to determine rainfall amounts during storm events.

k. Delineate the site for both land disturbing activities and areas that will be left undisturbed.

l. Install sediment controls and other BMPs that must be placed prior to the initiation of Construction Activity.

2. During Construction.

Before subcontractors or utility companies begin soil-disturbing activities, provide to them copies of applicable portions of the SWPPP, and require them to sign a SWPPP Subcontractor Certification, Form 25D-105. Include SWPPP Subcontractor Certifications as an appendix to the SWPPP. Ensure subcontractors and utility companies understand and comply with the SWPPP and the CGP. Inform subcontractors and utility companies of SWPPP amendments that affect them in a timely manner. Coordinate with subcontractors and utility companies doing work in the Project Zone so BMPs, including temporary and final stabilization are installed, maintained, and protected from damage.

Provide on-going training to employees and subcontractors, on control measures at the site and applicable storm water pollution prevention procedures. Training must be specific to the installation, maintenance, protection, and removal of control measures CGP 4.14. Training must be given at a frequency that will be adequate to ensure proper implementation and protection of control measures, and no less frequently than once a month during construction activity. Document on the SWPPP Training Log, Form 25D-125, the dates and attendees to these trainings. Include the SWPPP Training Log as an appendix to the SWPPP.

Notify the Engineer immediately if the actions of any utility company or subcontractor do not comply with the SWPPP and the CGP.

Comply with Subsection 107-1.11 Protection and Restoration of Property and Landscape. Concrete washout must be fully contained.

Comply with CGP Part 4.8.2 for fueling and maintenance activities. Place absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.

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

Keep the SWPPP and HMCP current (refer to Subsection 641-2.01.3, SWPPP Considerations and Contents)

3. Pollutant and Hazardous Materials 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. Orally report to the Engineer as soon as the permittee becomes aware of the incident,

b. Orally report to DEC within 24 hours after the permittee becomes aware of the incident, and

c. In writing, report to DEC within 5 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.

Notify the Engineer and COE Regulatory Program as soon as the permittee becomes aware of an incident of noncompliance with COE Permits.

Report spills of petroleum products or other hazardous materials to the Engineer as soon as the permittee becomes aware of the incident, the DEC (CGP Part 9.3), and other agencies as required by law. Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.

4. Corrective Action and Maintenance of BMPs.

Implement maintenance as required by the CGP, SWPPP, and manufacturer’s specifications, whichever is more restrictive.

a. Implement corrective action:

(1) If an incident of noncompliance with the SWPPP, or CGP is identified;

(2) If an Inspection or the Engineer identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants;

(3) If a required BMP was not installed according to the SWPPP schedule or phasing, or was installed incorrectly, or was not installed according to the CGP Part 4.0;

(4) If a BMP is not operating as intended, has not been maintained in an effective operation condition, or is unable to effectively perform the intended function;

(5) If sediment accumulates more than one-third of the distance of the above-ground height of the silt fence;

(6) If sediment accumulates to more than one-half retention height for an inlet BMP, check dam, berm, wattle, or other control measures;

(7) If a prohibited discharge of pollutants, as specified in CGP Part 4.7, is occurring or will occur; or

(8) If there is accumulation of sediment or other pollutants, that is in or near any storm water conveyance channels, or that may enter a discharge point or storm sewer system. If there is accumulation of sediment or other pollutants that is being tracked outside the project zone.

b. Implement corrective actions so that they comply with the following time requirements:

(1) For conditions that are easily remedied (i.e. removal of tracked sediment, maintenance of control measure, or spill clean-up), initiate corrective action within 24 hours and complete as soon as possible;

(2) If a discharge occurs during a local 2-year, 24-hour storm event, initiate a corrective action the day after the storm event ends;

(3) If installation of a new control measure is needed or an existing control measure requires redesign and reconstruction or replacement to make it operational, the corrective action must be completed within 7 calendar days from the time discovered.

(4) For all other conditions initiate corrective actions so both of the following requirements are met:

(a) Corrective action is completed in time to protect water quality; and

(b) Corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see Subsection 641-3.03.2 for more information).

If a corrective action is not implemented within the time requirements of this section, document the situation in the SWPPP, notify the Engineer, and implement corrective action as soon as possible.

If a corrective action could affect a subcontractor, notify the subcontractor within 3 days of taking the corrective action. Require in your written subcontract, that subcontractors must notify the Contractor within 24 hours of becoming aware of a condition that requires a corrective action.

5. Stabilization.

a. Stabilization may be accomplished using temporary or permanent measures. Initiate stabilization of disturbed soils, erodible stockpiles, disposal sites, and of erodible aggregate layers so that all of the following conditions are satisfied:

(1) Not later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased (CGP Part 4.5.1.1, Note:).

(2) As soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants; and

(3) As identified in the SWPPP.

b. Land may be disturbed and stabilized multiple times during a project. Coordinate work to minimize the amount of disturbed soil at any one time. Do not disturb more soil than you can stabilize with the resources available.

c. Temporarily stabilize from wind and water erosion portions of disturbed soils, portions of stockpiles, and portions of disposal sites, that are not in active construction. Temporary stabilization measures may require a combination of measures including but not limited to vegetative cover, mulch, stabilizing emulsions, blankets, mats, soil binders, low-erodible cover, dust palliatives, or other approved methods.

d. 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.

e. Before applying temporary or permanent seeding, prepare the surface to be seeded to reduce erosion potential and to facilitate germination and growth of vegetative cover. Apply seed and maintain seeded areas. Reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.

f. Apply permanent seed according to Sections 618 and 724, within the time periods allowed by the CGP and the contract, at locations where seeding is indicated on the plans and after land-disturbing activity is permanently ceased.

g. When installing a culvert or other drainage structure where stream bypass is not used, install temporary, or final stabilization concurrently or immediately after placing the culvert or drainage structure in a manner that complies with the SWPPP, applicable project permits and prevents discharge of pollutants. Install temporary or final stabilization:

(1) At the culvert or drainage structure inlet and outlet; and

(2) In the areas upstream and downstream that may be disturbed by the process of installing the culvert, culvert end walls, culvert end sections, or drainage structure.

h. Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, install final or temporary stabilization when approved by the Engineer:

(1) At the inlet and outlet of the culvert, drainage structure, or bridge;

(2) In the area upstream and downstream of the culvert, drainage structure, or bridge, that is disturbed during installation or construction of the culvert, drainage structure, or bridge; and

(3) Under the bridge.

Within 7 days of initiating final stabilization, either complete final stabilization or continue maintenance of work until final stabilization is complete, CGP Part 4.5.1.5,

Complete temporary stabilization within 14 days of initiating stabilization, CGP Part 4.5.1.2.

6. Ending CGP Coverage and BMP Maintenance in the Project Zone.

a. The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:

(1) Land disturbing activities have ceased;

(2) Final Stabilization has been achieved on all portions of the Project Zone, according to the CGP PART 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.); and

(3) Temporary BMPs have been removed.

b. After the Engineer has determined the conditions for ending CGP coverage have been met, the Department will:

(1) Send written notice to the Contractor with the date that the conditions were met;

(2) Submit an eNOT to DEC; and

(3) Provide a copy of the eNOT and DEC’s acknowledgement letter to the Contractor.

The Contractor is responsible for ending permit coverage within the Project Zone, by submitting an eNOT to DEC within 30 days of meeting the conditions for ending CGP coverage. The Contractor is responsible for BMP maintenance and SWPPP updates until permit coverage is ended.

If the Contractor’s CGP eNOI acreage includes Support Activities and any other areas where the Department is not an Operator, the Contractor may not be able to file an eNOT at the same time as the Department.  In this case, the Contractor must amend the SWPPP and separate SWPPP2(s), to indicate the Department’s CGP coverage has ended, and the Department is no longer an Operator within the Project Zone.

The Contractor must indicate in the SWPPP the areas that have reached Final Stabilization, and the dates land disturbing activities ended and Final Stabilization was achieved. The Contractor must submit an eNOT to DEC, and insert copies of the Department’s and the Contractor’s eNOTs with DEC’s acknowledgement letters in the appendix of the SWPPP.

The Contractor must submit a copy of each signed eNOT and DEC’s acknowledgement letter to the Department within 3 days of filing the eNOT or receiving a written response.

The Contractor is responsible for coordinating local government inspections of work and ending permit coverage with local government. See Subsection 641-1.03.5 for more information.

7. Transmit final SWPPP.

Transmit one copy of the final SWPPP, including all amendments, appendices, and maps, to the Engineer; when the project eNOTs are filed, or within 30 days of the Department’s eNOT being filed, whichever is sooner. Transmittal must be by both electronic and at least one hard copy.

**641-3.02 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 and a copy of the SWPPP, for at least three years after the date of eNOT. If EPA or DEC inspects the project, issues a Notice of Violation (NOV), or begins investigation for a potential NOV before the retention period expires, retain the SWPPP and all Records related to the SWPPP and CGP until at least three years after EPA and/or DEC has determined all issues related to the investigation are settled.

The SWPPP and related documents must be made available for review and copy, to the Department and other regulatory agencies that request them. See CGP Parts 5.10, 6.6 and 9.5.

**641‑3.03 SWPPP INSPECTIONS, AMENDMENTS, REPORTS, AND LOGS.** Perform Inspections, prepare Inspection Reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP. Update SWPPP Corrective Action Log Form 25D-112, SWPPP Amendment Log Form 25D-114, SWPPP Grading and Stabilization Activities Log Form 25D-110, SWPPP Project Staff Tracking Form 25D-127, and SWPPP Daily Record of Rainfall Form 25D-115. For active projects update the Records daily.

1. Inspection during Construction.

Conduct Inspections according to the schedule and requirements of the SWPPP and CGP.

Inspections required by the CGP and SWPPP must be performed by the Contractor’s SWPPP Manager and the Department’s 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 3 days of the Inspection date and document the date of the report transmittal.

2. Inspection Reports.

Use only the DOT&PF SWPPP Construction Site Inspection Report, Form 25D-100 to record Inspections. Changes or revisions to Form 25D-100 are not permitted; except for adding or deleting data fields that list: Location of Discharge Points, and Site Specific BMPs. Complete all fields included on the Inspection Report form; do not leave any field blank.

Insert a Complete-by-Date for each corrective action listed that complies with:

a. Section 641-3.01 (4), and

b. The CGP.

Provide a copy of the completed, unsigned Inspection Report to the Engineer by the end of the next business day following the inspection.

The Superintendent must review, correct errors, and sign and certify the Inspection Report, within 3 days of the date of Inspection. The Engineer may coordinate with the Superintendent to review and correct any errors or omissions before the Superintendent signs the report. Corrections are limited to adding missing information or correcting entries to match field notes and conditions present at the time the Inspection was performed. Deliver the signed and certified Inspection Report to the Engineer on the same day the Superintendent signs it.

The Engineer will sign and certify the Inspection Report and will return the original to the Contractor within three working days.

The Engineer may make corrections after the Superintendent has signed and certified the Inspection Report. The Engineer will initial and date each correction. If the Engineer makes corrections, the Superintendent must recertify the Inspection Report by entering a new signature and date in the white space below the original signature and date lines. Send a copy of the recertified Inspection Report to the Engineer on the day it is recertified.

If subsequent corrections to the certified Inspection Report are needed, document the corrections in an amendment memo that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent and the Engineer must both sign and certify the amendment memo. The issuance of an amendment memo does not relieve the Contractor of liquidated damages that may have been incurred as a result of the error on the original certified inspection report.

3. Inspection before Seasonal Suspension of Work.

Conduct an Inspection before seasonal suspension of work to confirm BMPs are installed and functioning according to the requirements of the SWPPP and CGP.

4. Reduced Inspection Frequencies.

Conduct Inspections according to the inspection schedule indicated in the approved SWPPP. Any change in inspection frequency must be approved by the Engineer, and beginning and ending dates documented as an amendment to the SWPPP.

If the Engineer approves and the entire site is stabilized, the frequency of inspections may be reduced to at least one inspection every 30 days. At actively staffed sites, inspect within 2 business days of the end of a storm event that results in a discharge from the site.

When work is suspended due to fall freeze-up, the Engineer may suspend inspection requirements after fourteen days of freezing conditions if:

a. Soil disturbing activities are suspended; and

b. Soil stabilizing activities are suspended.

Inspections must resume according to the normal inspection schedule identified in the SWPPP, at least 21 days before anticipated spring thaw. See CGP Part 6.2.3.

The Engineer may waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall during seasonal suspension of work. If so, resume collecting and recording weather data on the Daily Record of Rainfall form one month before thawing conditions are expected to result in runoff. Resume recording land disturbance and stabilization activities on the Grading and Stabilization Activities Log when Construction Activity resumes.

5. Stabilization before Fall Freeze-up and Spring Thaw.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to the anticipated date of fall freeze-up, in accordance with the CGP Part 4.12.

Exceptions to stabilization prior to anticipated date of fall freeze up include:

a. When stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, or

b. When winter construction activity is authorized by the Engineer and conducted according to the contract.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to spring thaw, as defined in the CGP.

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.

7. Items and Areas to Inspect.

Conduct Inspections of the areas required by the CGP and SWPPP.

8. SWPPP Amendments and SWPPP Amendment Log.

The Superintendent and the SWPPP Manager are the only persons authorized to amend the SWPPP and update the SWPPP Amendment Log Form 25D-114. The Superintendent or the SWPPP Manager must sign and date amendments to the SWPPP and updates to the SWPPP Amendment Log.

SWPPP Amendments must be approved by the Engineer.

Amendments must occur:

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

d. Whenever a BMP is modified during construction or a BMP not shown in the original SWPPP is added;

e. If the Inspection frequency is modified (note beginning and ending dates); or

f. When there is a change in personnel who are named in the SWPPP, according to Subsection 641-2.01.4.

Amend the SWPPP narrative as soon as practicable after any change or modification, but in no case, later than 7 days following identification of the need for an amendment. Every SWPPP Amendment must be signed and dated. Cross-reference the amendment number with the Corrective Action Log or SWPPP page number, as applicable. When a BMP is modified or added, describe the BMP according to Subsection 641-2.01.3.

Keep the SWPPP Amendment Log current. Prior to performing each scheduled Inspection, submit to the Engineer a copy of the pages of the Amendment Log that contain new entries since the last submittal. Include copies of any documents amending the SWPPP.

Keep the SWPPP Amendment Log as an appendix to the SWPPP.

9. Site Maps.

Document installation, routine maintenance, and removal of BMPs by making notes on the SWPPP Site Maps. Include the date and the recording person’s initials by these notes. Identify areas where Construction Activities begin, areas where Construction Activities temporarily or permanently cease, and areas that are temporarily or permanently stabilized.

10. Corrective Action Log.

The Superintendent and SWPPP Manager are the only persons authorized to make entries on the SWPPP Corrective Action Log, Form 25D-112. Document the need for corrective action within 24 hours of either:

a. Identification during an inspection; or

b. Discovery by the Department's or Contractor’s staff, a subcontractor, or a regulatory agency inspector.

Modification or replacement of a BMP, installation of a new BMP not shown in the original SWPPP, overdue BMP maintenance, or other reasons listed as corrective actions in 641-3.01.4 must be documented on the Corrective Action Log.

Within 24 hours of discovery, update the Corrective Action Log Form 25D-112, with the date of discovery and proposed corrective action. If discovered during an inspection, update log with inspection date and proposed corrective actions noted on the Inspection Report. If discovered outside of an inspection, update the log with the date of discovery, the proposed corrective action, and the date the corrective action was completed.

After the corrective action has been accomplished, note in the Corrective Action Log the action taken and if a SWPPP amendment was needed. Date and initial the entry.

Keep the Corrective Action Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection.

Keep the Corrective Action Log as an appendix to the SWPPP.

11. Grading and Stabilization Activities Log.

The Superintendent and SWPPP Manager are the only persons authorized to date and initial entries on the SWPPP Grading and Stabilization Activities Log, Form 25D-110. Use the SWPPP Grading and Stabilization Activities Log, to record land disturbance and stabilization activities.

Keep the Grading and Stabilization Activities Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection. Keep the Grading and Stabilization Activities Log organized and completed to demonstrate compliance with the CGP Part 4.5.

Keep the Grading and Stabilization Activities Log as an appendix to the SWPPP.

12. Daily Record of Rainfall.

Use SWPPP Daily Record of Rainfall, Form 25D-115, to record weather conditions at the Project. Update the form daily and include the initials of the person recording each day’s entry. Submit a copy to the Engineer prior to performing each scheduled Inspection. Keep the Daily Record of Rainfall as an appendix to the SWPPP.

13. Staff Tracking Log.

Use the SWPPP Project Staff Tracking, Form 25D-127, to keep staff records current. Include Records of the AK-CESCL or equivalent qualifications for the Superintendent, SWPPP Manager, ATS operator, any acting Superintendent and acting SWPPP Managers, and beginning and end dates for temporary personnel assignments related to administration of the CGP or Section 641. Update the SWPPP Staff Tracking Log within 24 hours of any changes in personnel, qualifications, or other staffing items related to administration of the CGP or 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 SWPPP, that may endanger health or the environment or for failure to perform work related to Section 641.

1. **Non-compliance.**

a. **Incidents of Non-compliance.** Failure to:

(1) Obtain appropriate permits before Construction Activities occur;

(2) Perform SWPPP Administration;

(3) Perform timely Inspections;

(4) Update the SWPPP;

(5) Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;

(6) Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;

(7) Perform duties according to the requirements of Section 641; or

(8) Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.

b. **Notice of non-compliance**, either oral or written will include:

(1) Reason/defects

(2) Corrective actions required

(3) Time allowed for completing the corrective action

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

(1) **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.

(2) **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:

(1) Withholding monies until corrective action is completed

(2) Assessing damages or equitable adjustments

(3) Employing others to perform the corrective action and deduct the cost

No additional Contract time or additional compensation will be allowed due to delays caused by the Engineer’s suspension of work.

**641‑3.05 ACCESS TO WORK.**

The Project, including any related off-site areas or support activities, must be made available for inspection, or sampling and monitoring, by the Department and other regulatory agencies. See CGP Part 6.6.

**641-4.01 METHOD OF MEASUREMENT.**

See Section 109 and as follows:

Item 641(1), and 641(7), are lump sum.

Item 641(5), measured on a contingent sum basis as specified by the Directive authorizing the work.

Item 641(6), measured on a contingent sum basis with withholding determined by the Department.

**TABLE 641-1 BMP VALUES - RESERVED**

Liquidated Damages assessed according to Table 641-2 are not an adjustment to the Contract amount. These damages charges are related to Contract performance but are billed by the Department to the Contractor, independent of the Contract amount. An amount equal to the Liquidated Damages may be withheld for unsatisfactory performance, from payment due under the Contract, until the Contractor remits payment for billed Liquidated Damages.

**TABLE 641-2- VERSION C**

**EROSION, SEDIMENT AND POLLUTION CONTROL – LIQUIDATED DAMAGES**

| **Code** | **Specification Section Number and Description** | **Deductible Amount in Dollars** | **Cumulative Deductible Amounts in Dollars** |
| --- | --- | --- | --- |
| **A** | 641-1.04 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

**641-5.01 BASIS OF PAYMENT.** See Subsection 641-3.04 Failure to Perform Work, for additional work and payment requirements.

Item 641(1) Erosion, Sediment and Pollution Control Administration. At the Contract lump sum price for administration of all work under this Section. Includes, but is not limited to, SWPPP and HMCP and SPCC Plan preparation, agency fees for SWPPP reviews, SWPPP amendments, pre-construction Inspections, Inspections, monitoring, reporting, and Record keeping or copying Records related to the SWPPP and required by the CGP, and Record retention.

Item 641(5) 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(6) Withholding. The Engineer may withhold an amount equal to Liquidated Damages, assessed according to Section 641, from payment due the Contractor. Liquidated Damages for violations of the Contract, CWA, 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(7) SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item 641(7) 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(7) does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item 641(1).

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(1) 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 No. Pay Item Pay Unit

641(1) Erosion, Sediment and pollution Control Administration Lump Sum

641(5) Temporary Erosion, Sediment and Pollution Control by Directive Contingent Sum

641(6) Withholding Contingent Sum

641(7) SWPPP Manager Lump Sum

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SECTION 642  
CONSTRUCTION SURVEYING AND MONUMENTS

Special Provisions

**642-2.01 MATERIALS.** Add the following:

4. Digital Measuring Instrument: Nu-metrics, Nitestar DMI ([www.ae-traffic.com](http://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:

1. mounted with the base a minimum of 5 ft above the shoulder,

2. located a minimum of 10 ft from the edge of shoulder,

3. 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.

CR642.1-022015

Add the following subsection:

**642-3.06 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. The Rover Unit shall be an “all on the pole” system equipped with the following:
   1. 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.
   2. 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.
   3. 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.
   4. 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.
   5. 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.
   6. 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:
   1. 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.
   2. 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.
   3. 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:
   1. 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.
   2. 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.
   3. Radio
      1. Transmission power, 25 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.
   4. Tripods – Provide one of each:
      1. Conventional tripod with extendible range pole. Include carrying case.
      2. Conventional wood tripod.
   5. 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:
   1. 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.
   2. 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.
   3. 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
   4. 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:
   1. 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.
   2. 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.
   3. Word Processing Software – Provide software that is compatible with the latest release of word processing software currently used by the Department.
   4. Spreadsheet Processing Software – Provide software that is compatible with the latest release of spreadsheet processing software currently used by the Department.
   5. 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.
   6. 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.

**642-4.01 METHOD OF MEASUREMENT.** Add the following:

Item 642(14) Contractor Furnished Engineering Tools. Contingent sum work will be measured in accordance with the directive authorizing the work.

**642-5.01 BASIS OF PAYMENT**. Add the following:

Pay Item 642(14) Contractor Furnished Engineering Tools. The Engineer shall issue a directive defining and authorizing the work. Payment for a GPS Rover, Base/Repeater Station, CORS, or Computer System will be made on a time and materials basis in accordance with Subsection 109-1.05-3e, Leased or Rented Equipment. Payment for training will be made on a time and materials basis in accordance with Section 109-1.05. If the training is beyond the Contractor’s ability or expertise, payment will be made in accordance with Subsection 109-1.05-4, Work by a Specialty Subcontractor. The Engineer may withhold payment for this item if the minimum specifications are not met. The Engineer may issue a directive at any time to terminate or re-authorize the work, at no additional cost to the Department.

Payment will be made under:

Pay Item No. Pay Item Pay Units

642(14) Contractor Furnished Engineering Tools Contingent Sum

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Special Provisions

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

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

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

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

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

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

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

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

1. Project name and number.

2. A designated TCP number and name on each page.

3. For TCPs more than one page, each page must be numbered.

4. The posted speed limit for each roadway.

5. Existing striping width, lane width, and road surfacing.

6. Construction lane widths, striping layout, and temporary pavement marker layout.

7. Provisions for Pedestrian, Bicycle, and ADA travel through the work zone.

8. Dates and times the TCP will be in effect and why it is being used.

9. The Worksite Traffic Supervisor’s signature certifying that all TCPs conform to the ATM and the Contract.

10. The Project Superintendent’s signature confirming the TCP is compatible with the work plan.

11. The name(s) of the Worksite Traffic Supervisor, his/her alternate and their 24-hour telephone number(s).

12. Signs to be used and the ASDS designation number and size.

13. Location and spacing of all devices and signs.

14. A plan to address any possible slopes, drop offs, paving joints, or similar temporary features that may occur during use of the TCP.

15. For TCPs proposed to be used at night, note how the requirements will be met for the required lighting and retroreflective material.

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

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

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

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

**Road Closures and Major Traffic Sequencing (events)**. Submit a written request to the Engineer for review and approval of each proposed event and event date. Allow 14 days for the Engineer to review any proposed event or subsequent changes/corrections. The proposed event date will be no less than 14 days from the date of written approval.

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See Subsection 643-3.08 for Major Utility Traffic Sequencing events.

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

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

a. Traffic Control Supervisor, American Traffic Safety Services Association (ATSSA)

b. Work Zone Temporary Traffic Control Technician, or Work Zone Safety Specialist, International Municipal Signal Association (IMSA)

Certify according to Form 25D-124 that the Worksite Traffic Supervisor has a minimum 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.

• Temporary traffic control work experience shall demonstrate an understanding of concepts, techniques, and practices in the installation and maintenance of traffic control devices, and skill in reading, interpreting, implementing, and modifying TCPs.

• Temporary traffic control work experience includes: flagging; installing traffic control devices in accordance with TCPs; monitoring traffic control devices and TCP performance; and recognizing and reporting deficiencies in traffic control devices and TCPs for correction.

• Temporary traffic control work experience is gained while serving as a Worksite Traffic Supervisor-in-training, temporary traffic control support personnel, and Flagger.

• Four thousand hours of experience serving solely as a Flagger does not satisfy these requirements.

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

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 barriersare 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, 20191** | **Devices Manufactured after**  **Dec. 31, 20191** | **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, if available, at Test Level 32, or DOT&PF eligibility determination |
| **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, if available, at Test Level 32, or DOT&PF eligibility determination |
| 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 of any traffic related accident that occurs within the project limits as soon as an employee or a subcontractor becomes aware of the accident.

**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.

Where specified in the Plans, Specifications, Special Provisions, and or the TCP: traffic may be maintained on a continuous gravel surface. Only one segment can be gravel at a given time.

1. **Specified Gravel Surface**. Traffic may be maintained on a continuous gravel surface where specified:

a. BOP to Station 21+00

b. Station 21+00 to EOP

2. **Gravel Surface Not Specified**.

a. Through traffic shall not traverse more than two gravel sections of roadway in any given period.

b. 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.

c. When approved by the Engineer.

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. Flagging Level I Certification by IMSA

b. Flagger Certification by ATSSA

c. Traffic Control Supervisor, ATSSA

d. Work Zone Safety Specialist, IMSA

e. ATSSA Flagging Instructor

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(23), 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 Delay/Lane** |
| 0 – 5,000 | $30 |
| 5,000 + | $40 |

**643-3.07 MAINTENANCE OF TRAFFIC DURING SUSPENSION OF WORK.** Approximately one month before work is suspended for the season, schedule a preliminary meeting with the Engineer and Maintenance & Operations to outline the anticipated roadway condition and the work expected to be completed before shutdown. Schedule a field review with the Department for winter maintenance acceptance. At the field review, the Engineer will prepare a punch list for implementation before acceptance.

To be relieved of winter maintenance responsibility, leave all roads with a smooth and even surface for public use at all times. Properly crown the roadbed surface for drainage and install adequate safety facilities. Make sure all illumination and signals, including vehicle detectors, are in good working order.

After the project is accepted for winter maintenance and until ordered to resume construction operations, the Department is responsible for maintaining the facility. The Department will accept maintenance responsibility only for portions of the work that are open to the public, as determined by the Engineer. The Department will not accept maintenance responsibility for incomplete work adjacent to accepted roads. The contractor is responsible for maintaining all other portions of the work. The Engineer will issue a letter of “Acceptance for Winter Maintenance” that lists all portions of the work that the Department will maintain during a seasonal work suspension. The contractor retains all contractually required maintenance responsibilities until receipt of this letter.

If the contractor suspends work due to unfavorable weather (other than seasonal) or due to failure to correct unsafe conditions, carry out Contract provisions, or carry out the Engineer’s orders. All costs for traffic maintenance during the suspended period will be borne by the Contractor.

When work is resumed, replace or renew any work or materials lost or damaged during temporary use. If the Department caused damage during winter suspension, payment will be made for repairs by unit pay item or in accord with Subsection 109-1.05, Compensation for Extra Work. When the Engineer directs, remove any work or materials used in the temporary maintenance. Complete the project as though work has been continuous.

**643-3.08 CONSTRUCTION SEQUENCING.** The construction sequencing detailed in these provisions, the Special Provisions, and the Plans is suggested only. The Contractor may propose alternative construction sequencing.

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

Unless otherwise determined by the Engineer and on an approved Traffic Control Plan (TCP), do not restrict traffic during the times listed below:

1. Monday through Friday: 0600 hrs to 0800 hrs and 1630 hrs to 1900 hrs.

2. Around any Holiday:

a. If a holiday falls on Sunday, Monday, or Tuesday, the above stipulations apply from 1200 hrs on the Friday before the holiday to 0300 hrs. on the day after the holiday.

b. If a holiday falls on Wednesday, the above stipulations apply from 1200 hrs on the Tuesday before the holiday to 0300 hrs. on the Thursday after the holiday.

c. If a holiday falls on Thursday, Friday, or Saturday, the above stipulations apply from 1200 hrs on the day before the holiday to 0300 hrs. on the Monday after the holiday.

Lane restrictions, if allowed shall be conducted so that no more than a 5 minute accumulated stopped delay, 20 vehicles, or 1/8 mile (660 feet) of traffic is detained, whichever occurs first, before releasing the detained motorists. During paving operations, a 10 minute stopped delay, 40 vehicles, or 1/4 mile (1320 feet) of traffic detained, allowed for motorists, except school buses. If a queue of traffic develops at a stop, empty the entire queue to include the last car that entered the queue at the time the queue was released.

Do not delay the school busses through the construction zone; obtain the local school bus schedule and coordinate work efforts. Submit the plan, as a TCP, to the Engineer for approval before the implementation of the school bus coordination plan.

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Major Utility Traffic Sequencing Events:

|  |  |
| --- | --- |
| **Event** | **Remarks** |
| ENSTAR crossing Ben Walters Lane | **Maximum Duration:** Two sequential days Monday through Saturday.  **Minimum Notice:** Three weeks’ notice to local businesses and property owners along Lake Street and adjacent side streets as determined by the engineer with an approved TCP.  a) Each full closure shall not be concurrent with other roadway closures.  b) All local accesses shall be maintained |
| ENSTAR/GCI crossing driveway at "LS" 14+24 LT |
| ENSTAR/GCI crossing driveway at "LS" 15+99 LT |
| ACS crossing driveway at "LS" 15+55 RT |
| ENSTAR crossing Lake Street at "LS" station 16+74 LT |
| ENSTAR/GCI crossing driveway at "LS" 18+74 |
| ENSTAR/GCI crossing Grubstake Avenue |
| ENSTAR/GCI crossing Smokey Bay Way |
| ENSTAR/GCI crossing Lake Street at "LS" 27+23 |
| ENSTAR/GCI crossing driveway at "LS" 28+62 RT |
| ENSTAR/GCI crossing driveway at "LS" 29+69 RT |

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**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 lights 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(25), 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(1) or 643(2), 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(1) or 643(2) Traffic Maintenance, except the following:

Traffic Price Adjustment

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(32) Flagging on a contingent sum basis at the rate of $58.00/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(23), 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(25), 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(25), Traffic Control.

12. **Portable Changeable Message Board Sign**. The contract price includes all resources required to furnish, move, and operate the sign.

Two Portable Changeable Message Board Signs used for Permanent Construction Signing paid for under Item 643(3) Permanent Construction Signs. Additional portable changeable message board signs will be paid for under 643(25), Traffic Control.

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 643-3.02.2. Specified Gravel Surface is subsidiary to Pay Item 401(1).

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 | $28.00 |
| 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 |
| Sequential Arrow Panel | Each/Day | $36.00 |
| 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 |
| Pilot Car (4x2, 1/2 ton truck) | Hour | $72.00 |
| Watering Truck – up to 4900 gallon capacity | M-Gallon | $28.00 |
| Watering Truck – more than 4900 gallon | M-Gallon | $21.00 |
| Street Sweeping: Regenerative Sweeper, Vacuum Sweeper,  Mechanical or Power Broom with Vacuum | Hour | $214.00 |
| 40,000 GVW Truck with Crash Attenuator | Hour | $162.00 |
| Plastic Safety Fence | Lineal Foot | $1.00 |
| Portable Changeable Message Board Sign | Calendar Day | $130.00 |
| Temporary Sidewalk Surfacing | Square Foot | $2.00 |
| Flexible Markers (Flat Whip, Reflective) | Each | $60.00 |
| Temporary Guardrail | Lineal Foot | $25.00 |

Payment will be made under:

Pay Item No. Pay Item Pay Unit

643(1) Traffic Maintenance Calendar Day

643(2) Traffic Maintenance Lump Sum

643(3) Permanent Construction Signs Lump Sum

643(4) Construction Sign Day

643(5) Type II Barricade Day

643(6) Type III Barricade Day

643(7) Traffic Cone/Tubular Marker Day

643(8) Plastic Safety Fence Linear Foot

643(9) Drum Day

643(10) Sequential Arrow Panel, Type C Day

643(11) Special Construction Signs Square Foot

643(12) Portable Concrete Barrier Each

643(13) Temporary Crash Cushion Each

643(14) Interim Pavement Marking Station

643(15) Flagging Hour

643(16) Pilot Car Hour

643(17) Street Sweeping Hour

643(18) Watering M-Gallon

643(19) Lane Closure Hour

643(20) Detour Day

643(21) Road Closure Day

643(22) One Lane Road Hour

643(23) Traffic Price Adjustment Contingent Sum

643(24) Portable Changeable Message Board Sign Day

643(25) Traffic Control Contingent Sum

643(26) Temporary Sidewalk Surfacing Square Yard

643(27) Temporary Guardrail Linear Foot

643(30) Portable Steel Barrier Linear Foot

643(31) Interim Pavement Marking Lump Sum

643(32) Flagging Contingent Sum

643(33) Detour Lump Sum

CR643-010120

SECTION 644  
SERVICES TO BE FURNISHED BY THE CONTRACTOR

Special Provisions

**644-2.01 FIELD OFFICE.** Delete this subsection in its entirety and substitute the following:

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 1500 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.

CR644.FOCOM-080120\_SSHC2015.17

Add the following Subsection 644-2.08 Engineering Communication:

**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

CR644.FOCOM-080120\_SSHC2015.17

**644-5.01 BASIS OF PAYMENT.** Add the following:

Pay Item 644(10) 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(1) Field Office and as such are paid by the Contractor.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

644(10) Engineering Communications Contingent Sum

CR644.FOCOM-080120\_SSHC2015.17

Special Provision

Add the following Section:

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.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

645(1) Training Program, Trainees/Apprentices Labor Hour

SSP-39-010116

SECTION 646  
CPM SCHEDULING

Special Provisions

**646-2.01 SUBMITTAL OF SCHEDULE.** Replace this Subsection with the following:

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.** Delete No. 2.

2. 60-Day Preliminary Schedule.

Delete the first sentence of No. 3. Schedule Updates. and substitute the following:

Hold job site progress meetings with the Engineer for the purpose of updating the CPM Schedule. Meet with the Engineer monthly or as deemed necessary by the Engineer.

CR646.1-070214

Special Provisions

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(1) Wide Pad Dozer, 65 hp min: payed at the rate of $150/hour.

Pay Item 647(5) Backhoe, 4WD, 1 cy Bucket, 75 hp min, 15 ft Depth: payed at the rate of $0/hour.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

647(1) Wide Pad Dozer, 65 hp Min Contingent Sum

647(5) Backhoe, 4WD, 1 cy Bucket, 75 hp Min, 15 ft Depth Contingent Sum

CR647-110316R

Special Provision

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:  ACS of the Northland (ACS)  City of Homer (HPW)  ENSTAR Natural Gas (ENSTAR)  General Communications, Inc. (GCI)  Homer Electric Association (HEA)  State of AK, DOT/PF Street Lights (DOT) |

State Facility Utilities: before beginning work, contact the Central Region Maintenance & Operations Office at (907) 269-0760 to obtain the District Superintendent's phone number where the project is located, and request locates.

Utilities Relocated by Others.

Utilities will be relocated by others concurrently with construction of this project. The Contractor will give the Utility, through the Engineer, 15 calendar days advance written notice regarding the dates when the utility owner is required to begin and end operations.

For utilities being relocated, 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. clear and grub. 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(1) Construction Surveying, if the Contractor is required to provide the surveying as part of the Contract and/or,

b. Under Pay Item 642(3) 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, 7 calendar days advance written notice for required staking.

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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; Section 409, Hot Mix Asphalt and Surface Treatments, Type R (Crumb Rubber) 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, in accordance with 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.

CR651-020118R

Work done by utility owner(s) is as follows:

The working days provided within this section for utility relocation only account for the time necessary to complete the described utility company construction and cutover work, with the assumption that the Contractor has performed, to the satisfaction of the utility, all necessary site preparations, and is ready/able to support utility construction activities when requested.  Utility company working days shall not be assumed to be consecutive and cannot overlap with the Contractor’s or other utility’s work unless expressly stated in the utility’s respective Agreement or approved by the Engineer.

**ACS of the Northland (ACS):**

ACS owns and operates telecommunications facilities within the project limits. The system consists of overhead and underground distribution lines and associated services. The following facilities will require relocation and/or adjustment:

The existing underground telephone cable at “SH” station 100+06, 60’ RT may be in conflict with the proposed rip rap outfall for Pipes P1-1 and P1-2. The contractor shall pothole the facility to determine if a conflict exists. If one (1) foot of separation cannot be maintained between the bottom of the proposed rip rap and the top of the cable ACS will adjust/lower in place to accommodate the proposed rip rap. **Allow ACS four (4) working days to complete the proposed adjustment as required.**

The existing underground telephone cable between “LS” station 12+74, 78’ RT and “LS” station 16+23, 29’ RT are in conflict with the proposed drainage improvements and will be relocated 5 feet off of the east ROW line. ACS will:

* Bore 2-inch conduit from “LS” station 12+83, 97’ RT to “LS” station 14+38, 49’ RT;
* Trench new cable in conduit from “LS” station 12+74, 78’ RT, through the new bore across Ben Walters Lane, ending at the HEA pole at “LS” station 16+23, 29’ RT; and
* Set new pedestal at “LS” station 12+74, 78’ RT.

Once cutover, ACS will retire the pedestal at “LS” station 13+45, 36’ RT and abandon the existing cable in place. **Allow ACS seven (7) working days to complete the proposed relocation and cutover work.**

The existing underground telephone cable crossing and along the west side of Lake Street and the associated service drop between “LS” station 14+86, 32’ LT and “LS” station 16+24, 29’ LT are in conflict with the proposed ditch improvements on project left and will be relocated. ACS will:

* Expose west end of the existing cable crossing Lake Street at “LS” station 16+21 and swing it into new pedestal set at “LS” station 16+20, 41’ LT; and
* Trench new underground service drop from the new pedestal around the north side of the existing building to the proposed NID location at the back of the structure.

Once cutover, ACS will retire the existing pedestals at “LS” station 14+86, 32’ LT and 15+43, 173’ LT and will abandon the existing cable in place. **Allow ACS six (6) working days to complete the proposed relocation and cutover work.**

The existing underground telephone cable between “LS” station 18+35, 27’ RT and “LS” station 19+74, 54’ RT is in conflict with the proposed storm drain improvements and sewer main replacement and will be relocated. ACS will:

* Trench new cable from HEA pole at “LS” station 18+35, 27’ RT 5 feet off of ROW to the existing pedestal in the existing utility easement at “LS” station 20+03, 176’ RT.

Once cutover, ACS will abandon the existing cable in place. **Allow ACS six (6) working days to complete the proposed relocation and cutover work.**

The existing service drop feeding the City of Homer SCADA panel for the PRV vault at “LS” station 30+46, 30’ LT is in conflict with proposed ditch improvements panel relocation and will be relocated. ACS will:

* Expose the existing service cable and swing it into the panel mounted NID to serve the new PRV SCADA panel location at “LS” station 30+43, 44’ LT 5 feet off the west ROW line.

**Allow ACS four (4) working days to complete the proposed relocation work.**

**ENSTAR Natural Gas Company (ENSTAR):**

ENSTAR owns and operates natural gas distribution mains and services within the project limits. The following facilities will require relocation and/or adjustment:

The existing 4-inch plastic gas main crossing Lake Street at “LS” station 11+73 is in conflict with the proposed ditch improvements and will be relocated. ENSTAR will:

* Bore new 4-inch main crossing Lake Street at “LS” station 12+99;
* Trench new 4-inch main 5 feet off ROW from “LS” station 11+48, 66’ LT to 12+99, 73’ LT to tie into the west end of the new 4-inch crossing;
* Trench new 4-inch main 5 feet off ROW in joint trench with GCI from “LS” station 11+38, 291’ RT to 12+98, 79’ RT to tie into the east end of the new 4-inch crossing; and
* Cutover new 4-inch main to the existing 4-inch main.

Once cutover, ENSTAR will abandon the existing 4-inch crossing in place. **Allow ENSTAR ten (10) working days to complete the proposed relocation work.**

The existing 2-inch plastic main between “LS” station 11+46, 72’ LT and 13+47, 26’ LT and between “LS” station 13+43 RT and 30+89, 26’ RT and the associated services are in conflict with the proposed drainage improvements and will be relocated. ENSTAR will:

* Trench new 2-inch plastic main 5 feet off ROW in joint trench with GCI starting from the new 4-inch main tie-in at “LS” station 12+99, 66’ LT to “LS” station 27+23, 40’ LT;
* Bore new 2-inch plastic main crossing Lake Street at “LS” station 27+23;
* Bore new 2-inch plastic main crossing Ben Walters Lane from “LS” station 12+94, 84’ RT to “LS” station 13+33, 89’ RT to capture the existing 2-inch main on north side of Ben Walters Lane;
* Trench new 2-inch plastic main 5 feet off ROW in joint trench with GCI from “LS” station 27+23, 39’ RT to “LS” station 30+89 RT and tie into the existing 2-inch plastic main;
* Trench or bore new 1-inch plastic service crossing lake Street at “LS” station 16+74 to intercept the existing service line on project RT;
* Trench new 2-inch plastic main from “LS” station 20+71, 70’ RT to 23+56, 67’ RT crossing Smokey Bay Way and cutover new line to the existing 2-inch plastic main running along the south side of Smokey Bay Way; and
* Cutover existing services to the new 2-inch main at “LS” station 17+41, 49’ LT, 20+71, 70’ RT, 23+56, 67’ RT, 27+35, 49’ RT, and 30+14, 45’ RT.

Once cutover, ENSTAR will abandon the existing 2-inch plastic line in place. **Allow ENSTAR eighteen (18) working days to complete the proposed relocation work.**

**GCI Communication Corp (GCI):**

GCI owns and operates telecommunication facilities within the project limits. The system consists of underground distribution lines and service drops. The following facilities will require relocation and/or adjustment:

The existing .750 and .500 coax cables between “LS” station 12+63, 25’ LT and 19+76, 25’ LT are in conflict with the proposed drainage improvements and will be relocated. GCI will:

* Joint bore with ENSTAR two (2) new 2-inch conduits and one (1) new 1.25-inch conduit crossing Lake Street at “LS” station 13+00;
* Bore two (2) new 2-inch conduit crossing Lake Street at “LS” station 19+82;
* Joint bore with ENSTAR new 2-inch conduit crossing Lake Street at “LS” station 27+24;
* Install new .625 coax in 1.25-inch conduit, .875 coax in 2-inch conduit, and a 2-inch spare conduit in joint trench with ENSTAR from the existing pedestal on the north side of the Sterling Highway at “SH” station 103+34, 48’ LT, through the bore across Lake Street, ending the .625 coax at “LS” station 16+41, 44’ LT and ending the .875 coax and spare conduit at “LS” station 19+73, 45’ LT;
* Trench new .875 coax in 2-inch conduit and 2-inch spare from “LS” station 19+73, 45’ LT, through the new bore crossing Lake Street at “LS” station 19+82, and ending at the existing pedestal in the utility easement at “LS” station 20+08, 179’ RT;
* Continue installation of 2-inch spare conduit in joint trench with ENSTAR from “LS” station 19+73, 45’ LT, through the new bore at “LS” station 27+24, ending at “LS” station 30+24, 48’ RT;
* Trench 2-inch spare conduit 5 feet off of ROW from “LS” station 18+62, 46’ RT to “LS” station 19+89, 50’ RT and continuing to the existing pedestal in the utility easement at “LS” station 20+08, 179’ RT;
* Install 2-inch spare conduit in joint trench with ENSTAR from existing pedestal at “LS” station 22+47, 99’ RT to “LS” station 23+52, 69’ RT;
* Set new pedestals at “LS” stations:

|  |  |  |  |
| --- | --- | --- | --- |
| 12+99, 66’ LT | 16+41, 44’ LT | 18+62, 46’ RT | 19+73, 45’ LT |
| 23+52, 69’ RT | 26+92, 45’ LT | 30+25, 45’ RT |  |

* Cutover new coax facilities and retire the pedestals at “LS” station 13+67, 47’ LT and 19+63, 33’ LT

Once cutover GCI will abandon the existing .750 coax, .500 coax, and conduit in place. **Allow GCI twenty-six (26) working days to complete the proposed relocation work.**

**Homer Electric Association, Inc (HEA):**

HEA owns and operates electrical facilities within the project limits. The system consists of overhead and underground primary distribution lines and overhead and secondary service lines. The following facilities will require relocation and/or adjustment:

The existing underground 3Ø primary electric cables at “SH” station 100+07, 59’ RT may be in conflict with the proposed rip rap outfall for Pipes P1-1 and P1-2. The contractor shall pothole the facility to determine if a conflict exists. If one (1) foot of separation cannot be maintained between the bottom of the proposed rip rap and the top of the electric cables the contractor shall coordinate with HEA to either modify the rip rap out fall or provide mechanical protection over HEA’s facilities. **Allow HEA three (3) working days to coordinate with the contractor to determine a proposed resolution as necessary.**

The existing load center at “SH” station 100+58, 61’ LT will be relocated and the underground secondary service feeding the load center will be impacted. HEA will:

* Expose and swing the existing secondary service into the new load center if the conductor is determined to be of adequate length and in usable condition; or
* Install new secondary service run from existing electric pedestal 5836A at “LS” station 12+71, 84’ RT to the proposed load center location at station 10+59, 60’ RT.

Once the load center has been installed and green tagged, HEA will energize the service to the load center. **Allow HEA six (6) working days to complete the proposed relocation work.**

The existing power poles at “LS” station 13+56, 33’ RT and 13+94, 54’ LT are in conflict with the proposed ditch cuts and will be relocated. HEA will:

* Install new 45 ft pole in the same location as the existing pole at “LS” station 13+56, 33’ RT poles to accommodate the ditch cut on project RT;
* Install new 40 ft pole 6 feet west of the existing pole at “LS” station 13+98, 60’ LT;
* Reattach the existing overhead power facilities to the new poles; and
* Retire the existing pole at “LS” station 13+94, 54’ LT.

**Allow HEA five (5) working days to complete the proposed relocation work.**

The existing underground three phase primary distribution lines at “LS” station 15+04, 39’ RT are in conflict with the proposed ditch cuts and will be relocated. HEA will:

* Install new conduit four feet below proposed ditch bottom between Pole 5531 at “LS” station 15+09, 29’ RT and “LS” station 14+95, 56’ RT;
* Install new riser on Pole 5531
* Set new three phase junction box at “LS” station 14+95, 56’ RT to capture existing underground 3Ø primary lines;
* Pull new conductor from Pole 5531 through the conduit to the junction box at “LS” station 14+95, 56’ RT;
* Terminate and cut over new facilities at Pole 5531 and in the junction box; and
* Retire and remove the old riser and cable.

**Allow HEA five (5) working days to complete the proposed relocation work.**

The existing wood light pole at “LS” station 16+23, 29’ LT is in conflict with the clear zone and the proposed ditch cuts on project left and will be relocated. HEA will:

* Install new wood light pole assembly at “LS” station 16+23, 42’ LT;
* Run new secondary conductor from the existing power pole at “LS” station 16+23, 29’ RT to the new light pole location; and
* Retire the existing light pole.

**Allow HEA three (3) working day to complete the proposed relocation work.**

The existing guy pole and anchor at “LS” station 18+24, 32’ LT is in conflict with the proposed ditch cut on project left and will be relocated. HEA will:

* Install new guy pole at “LS” station 18+24, 78’ LT;
* Install new anchor at “LS” station 18+23, 93’ LT;
* Run new guy wire from existing electric pole at “LS” station 18+35, 27’ RT to the new guy pole at “LS” station 18+24, 78’ LT; and
* Retire the existing guy pole, anchor and down guy.

**Allow HEA three (3) working day to complete the proposed relocation work.**

The existing wood light pole at “LS” station 22+96, 69’ RT is in conflict with the proposed sewer service relocation and will be relocated. HEA will:

* Disconnect existing service feeding the light pole;
* Expose the ten feet oaddf underground secondary conductor closest to the existing pole;
* Install new light pole assembly at “LS” station 23+01, 78’ RT;
* Re-use the existing secondary conductor to feed power to the new light pole; and
* Retire the existing light pole.

**Allow HEA three (3) working day to complete the proposed relocation work.**

The existing wood light pole at “LS” station 24+96, 39’ LT was originally contained within the fencing of HEA’s equipment yard. The project acquired the ROW from HEA where the pole is located. The pole will be relocated back onto HEA’s property. HEA will:

* Install new light pole assembly at “LS” station 24+87, 56’ LT;
* Re-use the existing overhead secondary conductor to feed the new light pole; and
* Retire the existing light pole at “LS” station 24+96, 39’ LT.

**Allow HEA three (3) working day to complete the proposed relocation work.**

The existing wooden light pole at “LS” station 30+17, 44’ LT is conflict with the proposed PRV modification work and will be relocated. HEA will:

* Install a new light pole assembly at “LS” station 30+19, 53’ LT;
* Feed the new light pole using the existing overhead secondary conductor; and
* Retire the existing light pole at “LS” station 30+17, 44’ LT.

**Allow HEA three (3) working day to complete the proposed relocation work.**

The existing secondary service feeding the City of Homer SCADA panel for the PRV vault at “LS” station 30+46, 30’ LT is in conflict with the proposed ditch modification and panel relocation. HEA will:

* Disconnect the existing service to the load center so it can be relocated;
* Install new secondary service from the existing pad mount transformer 5013 at “LS” station 30+31, 84’ LT to the proposed SCADA panel location at “LS” station 30+43, 44’ LT;
* Re-energize the new panel; and
* Abandon the existing service.

**Allow HEA four (4) working days to complete the proposed relocation work.**

Z524610000

**651-1.04 COOPERATION BETWEEN CONTRACTORS.** The following state owned projects may be under construction concurrently with this project.

|  |  |
| --- | --- |
| **Project Name:** | **Project No.:** |
| Pioneer Avenue Pavement Preservation | 0414015 /  CFHWY00148 |
| HSIP: Sterling Highway & Main Street (Homer) Intersection Improvements | 0211060 /  Z559840000 |
| Homer West Hill Road Pavement Preservation | 0001599 /  CFHWY00300 |
| Homer East Hill Road Pavement Preservation | 0001600 /  CFHWY00297 |

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.

CR651-020118R\_SSHC2015.17/Z524610000

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 the last sentence in 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 periods of multiple shift work in the CPM Schedule. Revise to the proposed CPM Schedule promptly. Promptly submit a revised CPM Schedule if there are substantial changes to the schedule, or upon request of the Engineer."

**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."

CR652-071519

Special Provision

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 No. Pay Item Pay Unit

654(1) Eagle Monitoring Contingent Sum

CR654-100117

Special Provision

Replace Section 660 with:

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

1. Equipment List(s) and Drawings. Within 30 days after the Contract award, submit 8 collated copies of a 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:
   1. 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.
   2. Materials Not on the *Qualified Products Lis*t: 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.
   3. 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.
   4. 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:
   1. Location and depth of conduit runs
   2. Station and offset of all junction boxes
   3. Heights of signal faces and overhead signs
   4. 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 in clear plastic envelopes and attach to the inside of each controller cabinet.

1. 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.

1. 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.

1. 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:

1. Backfill foundations with material that meets the requirements of Selected Material, Type A that passes through a 3 inch sieve.
2. 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.
3. 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.
4. 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 504-3.01.8. 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 exiting 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. 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.

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. 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.**

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.
2. Form the entire controller foundation and the top 12 inches of pole or post foundations and give the top a smooth steel trowel finish.
3. 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.
4. When a CMP is used, over-excavate the area around the form enough to allow for proper compaction around the form. Perform backfill operations according to Section 204. Do not use water for drilling operations or for any other purpose where it may enter the hole.
5. Use controller cabinet anchor bolts as recommended by cabinet manufacturer and set with a template.
6. Place Class A concrete meeting Section 501. Place reinforcing steel meeting Section 503. If required, use corrugated steel pipe that is at least 14 gage, meeting Subsection 707-2.01.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.

1. 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.
   1. Install pipe piles according to Section 505.
   2. Install pipe piles open-ended and to a minimum depth of 15 feet (less top projection).
   3. Use CJP groove welds for all circumferential welds.
   4. Inspect 100% of CJP welds using UT or RT.
   5. Backfill and compact the work hole around upper portion of each pile in 8-inch lifts with a soil-cement mixture.
   6. 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.
      1. All Foundations.
3. Install frangible couplings according to the manufacturers written installation instructions. Use shims furnished by the coupling manufacturer.
4. 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.
5. 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.
6. Existing foundations may be abandoned-in-place. 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. 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 drain pipes, 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. 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.
22. 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:
    1. When the conduits contain cables that will remain in service, leave the cables in place during the cleaning, and
    2. Ream empty conduits with a mandrel or cylindrical wire brush before blowing them out with compressed air.
23. 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.
24. 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.
25. 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.
26. Remove the ends of abandoned conduits from junction boxes that will remain in service.
27. When Plans call for connecting polyethylene conduit to RMC use a UL listed electrofusion coupler rated for direct bury application. The coupler must be rated for same wall thickness as the adjoining conduits. If electrofusion coupler fails to properly bond to conduits, the Engineer may give approval to use DuraLine Shur Lock type couplers or approved equivalent, but only after first attempting use of electrofusion couplers in each case. 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. 400 feet for conduits that contain signal interconnect cable only.

2. 300 feet for conduits, that exclusively contains two loop lead-in cables.

3. 300 feet for conduits that contain a single cable other than signal interconnect.

4. 190 feet for conduits, that contains 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, install the tops of junction boxes to 2 inches below all other areas.

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 stone drain under each junction box. Drains shall consist of porous backfill material that conforms to Subsection 703-2.10. Minimum drain dimensions 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:
   1. The prescribed clearances around conduit ends are provided,
   2. Crushed rock sumps are installed under junction boxes,
   3. Conduit ends protrude above the bottom of junction boxes within the prescribed range,
   4. New conduits are free of material that became lodged in them during the completion of the work,
   5. Reused conduits are cleaned according to Subsection 660-3.03,
   6. Junction boxes are set to grade, and
   7. 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 clock wise (CW), counter clock wise (CCW), etc.

1. 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. Solder the loop and lead-in conductors together using the pre-loaded low temperature solder with heat shrink tubing approved splice connector.

**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 |
| Usually a spare pair | Orange and Black |

e. Crimp spade terminals to the ends of the shielded pairs in the controller cabinet.

1. 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.
2. 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.

1. 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.
2. 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.
3. Label the cables used in the signal and illumination systems with the following legends:
   1. Use the legends included in Table 740-2, for the cables listed.
   2. 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.
   3. 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.

Furnish the two types of identification tags listed below that feature hand written 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. 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. 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.
3. Terminate the control and power cables as shown in Table 740-2.
4. Telemetry cable termination shall be coordinated with a signal technician. Provide type No. 66B3-50 terminal blocks as required.
5. 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.

1. Retrofit reused poles with new tap wires, fused disconnect kits, and fuses.
2. 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.
3. 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:
   1. Ensure the cabinet is free of paint scratches, dents, sharp edges, and other physical defect.
   2. Ensure cabinet hinges, heater, ventilation system, lighting, and door locking mechanism function properly.
   3. Ensure that there are no short circuits between AC+, AC-, and GND anywhere in the cabinet.
   4. Check that there is no continuity between AC+ and DC+.
   5. Check for continuity between any green wire connection point and GND.
   6. 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(1X) Traffic Signal System Complete.

1. Controller Cabinet Installation.
   1. 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.
   2. 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.
   3. 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.
   4. 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.
   5. 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.
   6. See Subsection 660-3.05 and Section 740 for wiring requirements.
2. Controller Operation. Provide the following operations.
   1. 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.
   2. 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.
   3. Wire the controller cabinet so that removal of the conflict monitor causes the intersection to go into flashing operation.
   4. Accomplish transfer to flashing operation by relays between the normal load switching device and the field terminals.
   5. Do not operate pedestrian pushbuttons at more than 24 volts.
   6. 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.

* 1. 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.
  2. Railroad Preemption. The Railroad Preemption Routine must consist of 4 functional intervals in the order listed below:
     1. Enter Preemption Interval.
        + 1. Energize a 120 VAC alarm circuit which may be used for a sign, bell, or beacon.
          2. 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.
          3. Following the pedestrian clearance period, the controller must advance into and time normally the vehicle clearance intervals.
          4. If the preemption is received while in the track clearance phase(s), skip step (b) and (c) above.
     2. Track Clearance Interval.
        + 1. 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.
          2. 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 with the exception of not serving those phases that conflict with the railroad crossing. Keep this interval in effect until the preemption call is removed.
     4. Leaving Preemption Interval.
        + 1. De-energize alarm circuit.
          2. Immediately advance to the active phase normal pedestrian and/or vehicle clearance interval(s).
          3. The controller must advance to those phases that were omitted under preemption control when complete control is returned to the controller unit.
  3. Emergency Equipment Preemption. The Emergency Equipment Preemption Routine must consist of 3 functional intervals in the order listed below:
     1. Enter Preemption Interval.
        + 1. Energize a 120 VAC alarm circuit which may be used for a sign, bell, or beacon.
          2. 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.
          3. Following the pedestrian clearance period, the controller must advance into and time normally the vehicle clearance intervals.
          4. 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 antiseizing 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 antiseizing 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.

1. 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.

1. 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 the Traffic Signal Hardware Detail Sheet in the Plans. 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 |

1. 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.

1. 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.
2. 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.
3. 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.

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

1. The dates and times beginning and completing work, and the names of the Crewmembers completing the work.

2. The characteristics of the equipment failure or faulty operation evident before repair.

3. The changes made or corrective actions taken.

4. 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 15.0 feet.

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:

1. For overhead signals located 53 feet and more from the stop line, maintain 18.0 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.

2. For side mounted signals, maintain 9 feet to 11 feet of clearance between the traveled way and the bottom of the signal.

3. Align overhead signals controlling a single lane with the center of the lane.

4. Align overhead signals controlling two lanes with the lane lines separating the lanes.

5. 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.

a. With two or more through lanes, center one signal head over each lane.

b. 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.

c. Otherwise, install the relocated signal 8 feet to the right of the signal centered over the through lane.

6. For pedestrian signals, maintain 7 to 9 feet between the traveled way and the bottom of each pedestrian signal.

7. Aim signal heads according to Table 660-2 found in Subsection 660-3.08 Signal and Lighting Structures.

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, loop, EVP, UPS, interconnect, and telephone. Label loops 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.

1. 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.
2. 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.
3. EVP Components: When called for in the plans provide EVP components including all cables and mounting hardware. Ensure proper operation of EVP system.
4. 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.
5. 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.
6. 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:

Item 660(9), Bored Casing. By the linear foot along the slope of the bored or jacked casing for the actual length bored or jacked, in place.

Item 660(11), Traffic Loop. By each loop unit, complete and in place, including all conduit, conductors, and other equipment to the nearest junction box.

Item 660(11A) 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.

Item 660(13), Relocate Electrolier. By each complete unit, removed, relocated, reinstalled, and functional.

Item 660(14) Temporary Electrolier. By each electrolier and foundation furnished, installed, and maintained as directed by the Engineer.

**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
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(1A) Traffic Signal System Complete, Sterling Highway.

1. Signal structures

2. Traffic controller assemblies including assembly testing and preparation, vehicle and pedestrian indications, video detection systems, radar detection, inductive loop detection, 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(3) Highway Lighting System Complete, Sterling Highway.

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(11A) 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.

Pay Item 660(14 ) 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 $2400/each. The Engineer does not require a change order/directive for this Pay Item.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

660(1A) Traffic Signal System Complete, Sterling Highway Lump Sum

660(3) Highway Lighting System Complete, Sterling Highway Lump Sum

660(7) Temporary Signal System Complete, Sterling Highway Lump Sum

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SECTION 661  
ELECTRICAL LOAD CENTERS

Special Provisions

**661-2.01 MATERIALS.** Add the following:

Anchor Bolts Section 740-2.02

Load Center. Replace the 1st paragraph with the following:

NEMA 3R enclosure constructed of .125” thick aluminum, with no external screws, bolts, or nuts.

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Equipment List(s) and Drawings.

Delete No. 1. and replace 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.

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Special Provisions

Add the following Section:

SECTION 662  
FIBER OPTIC SIGNAL INTERCONNECT SYSTEM

**662‑1.01 DESCRIPTION.** Furnish and install fiber-optic signal interconnect system as shown on the Plans along the route indicated or on a route as directed by the Engineer.

**662-1.02 INSTRUCTIONS AND GUARANTEES.** One set of maintenance and repair manuals shall be included with each project installation and submitted to the designated traffic signal technician through the Engineer.

No changes or substitutions in these requirements will be acceptable unless authorized in writing.

The supplied conduit shall carry a two-year warranty from the date of project acceptance to be free of defects. The installer shall be fully responsible for the installation of defect free conduit and for the replacement of any conduit found to be defective.

**662-2.01 MATERIALS.** Submit materials for review and approval per the requirements of subsection 106-1.05, Certificates of Compliance and subsection 660-2.01, Materials.

**662-2.02 POLYETHYLENE DUCT SYSTEM.** Install a high density polyethylene (HDPE) duct system in which to pull the interconnect cable. Unless noted on the plans install conduit per the requirements of 660-3.03, Conduit.

Unless specified on the plans, furnish 2-inch HDPE conforming to the requirements of subsection 740-2.06 Electrical Conduit and Fittings.

Furnish fittings used in the duct system such as elbows, etc., made from the same type polyethylene as the duct. Fuse connections using the manufacturer’s recommended procedure and equipment.

Mark underground conduits with a continuous strip of detectable marker tape. Marking tape shall feature the words “Buried Fiber-optic Cable” (or similar). Two strips shall be laid horizontally side by side above the conduit(s) 12 inches below final grade. The marking tape shall be at least 6 inches wide, at least 7 mils thick, be locatable by conductive and inductive methods, and be orange in color.

Keep junction boxes and ends of the conduit covered unless pulling conductors.

Use care during compaction operations to prevent damage to the junction boxes and conduits. Remove and replace items damaged as per subsection 105-1.11.

After testing and installing the conductors, plug conduit openings with duct seal to prevent water from entering the duct system.

**662-2.03 FIBER-OPTIC CABLE.** Cable shall be suitable for placement in an underground duct and shall conform to:

• United States Department of Agriculture Rural Utilities Service (RUS) standard 7 CFR 1755**.**900.

• Department of Agriculture Rural Electrification Administration (REA) Bulletin 1753f-601 (PE-90) dated August 4, 1994, and these specifications.

• National Electrical Code (NEC) Article 770; NFPA 70-National Fire Protection Agency.

* National Electrical Contractors Association (NECA) / Fiber Optic Association (FOA) 301

• Telecommunications Industry Association/Electronic Industries Association (TIA/EIA) FOTP-Fiber-optic Test Procedures.

1. Fibers.

a. Fiber-optic cables shall be loose tube, all-dielectric, non-metallic slotted core with an integral dry water blocking tape and sheath designed for indoor/outdoor installation. Each cable shall be equipped with 6 kink resistant buffer tubes containing 12 optical fibers each. Buffer tubes shall be stranded around a dielectrical anti-buckling central strength member using a reverse oscillation or “SZ” stranding process.

b. Each buffer tube shall have an inside diameter much larger than total diameter of the fiber it supports.

c. Fillers are allowed in the cable to achieve cable cross-section symmetry.

d. All cable fibers shall be usable and shall be sufficiently free of surface imperfections and inclusions to meet or exceed the optical, mechanical, and environmental requirements contained in this specification.

e. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding.

f. Fibers shall contain no factory splices.

1. Fiber coating shall be a dual-layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be mechanically or chemically strippable without damaging the fiber.
2. Repairs to the fiber coatings are not allowed except as determined by the designated traffic signal technician at designated splice locations.
3. Two (polyester or aramid) yarn binders shall be applied contra-helically with sufficient tension to secure each buffer tube layer to the central strength member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking, and dielectric with low shrinkage.
4. Tensile strength shall be provided in the cable by a combination of high tensile strength yarns helically stranded around the cable core. High tensile strength yarns shall be wrapped helically around the buffer tubes before the application of the outer jacket (sheath).
5. Individual buffer tubes and optical fibers shall be distinguishable by means of distinct and recognizable color-coding in accordance with TIA/EIA-598-B, “Optical Fiber Cable Color Coding.” The colors shall be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Ensure colors do not cause fibers to stick together.

l. Distinguish each fiber and buffer from others by means of color-coding according to the following:

|  |  |  |
| --- | --- | --- |
| 1. Blue | 5. Slate | 9. Yellow |
| 2. Orange | 6. White | 10. Violet |
| 3. Green | 7. Red | 11. Rose |
| 4. Brown | 8. Black | 12. Aqua |

1. For cables containing more than 12 buffer tubes, use the color code shown above for tubes 1 through 12, and use stripes or tracers in conjunction with the standard color code for tubes 13 through 24.

2. Jacket.

a. The outer jacketing (sheath) material shall be applied directly over the high tensile strength yarns. The minimum nominal jacket thickness shall be 55 mils.

1. The outer jacket material shall be a medium density polyethylene (MDPE) conforming to ASTM D1248, Type II, Class C, Category 4 or 5, Grade J4. The light absorption coefficient, when measured in accordance with ASTM D3349, shall be a minimum of 400 at a wavelength of 375 nanometers.
2. The polyethylene jacket (sheath) shall contain carbon black to provide ultra-violet light protection. The jacket material shall be fungus inert as described in ASTM G21.
3. The jacket shall be free of any holes, splits, or blisters.

3. Cable Features.

a. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

1. The shipping, storage and operating temperature range of the cable shall be –400 F to +1600 F.
2. The fiber-optic cable shall be capable of withstanding a maximum pulling tension of 600 lbs during installation (short-term loading) and 200 lbs (long term loading) with no damage. Tensions on the cables shall not be exceeded under any circumstances.

4. Manufacturer.

1. All Fiber-optic Cable shall be supplied by an ISO9001 certified manufacturer who is regularly engaged in the production of these specifications for fiber-optic cable.
2. Fiber-optic cables shall be manufactured, tested, and prepared for shipping by one manufacturer. That manufacturer shall provide all fiber-optic cables and connectors called for on the project.

5. Cable Markings.

1. Markings shall be approximately 1/8‑inch (3 mm) nominal height.
2. Be clearly legible and distinguishable.
3. Made at 2‑foot intervals to be used as length markers.
4. If initial markings fail to meet marking criteria (i.e., non-legible, incorrect spacing, spelling error, etc.), cables may be remarked to meet criteria. Cable markings shall include:

* Cable ID
* Sequential numbers in whole foot or meter intervals to determine the length of the cable and amount remaining on the reel.
* Number of fibers
* “SM” (for Single Mode Fiber)
* “ADOT Fiber”

**662-2.04 FIBER-OPTIC DROP CABLE (PATCH PANEL).** Drop Cable is defined as the assembly or pigtail consisting of fiber-optic cable, connectors, protective tubing, fan-outs (if required) and all incidental materials. This is used for connectivity between a fiber trunk cable and field devices (i.e., signal controller, modems etc.). Drop cables shall be factory assembled. Drop cables shall be packaged individually within a plastic bag marked clearly with the manufacturer’s part number. Fiber-optic drop cables shall be a SM fiber Gator patch Drop cable with LC or SC type as shown on plans Duplex connections manufactured by Fiber Connections Inc. or an approved equal. Pigtail shall be approximately 100 feet in length (30 meters).

Cable design and installation shall meet requirements for outdoor use as described in subsection 662-2.03, Fiber-optic Cable. Optical jackets (3mm), where used, shall be yellow for single mode fibers. No splices are allowed within the cable length. Non-connectorized ends shall be suitable for heat fusion splicing as described in subsection 662-3.09, Splices.

Factory testing information of each Fiber-optic Drop cable (fully assembled) shall be provided for each connector/fiber. The information shall be provided in test tags attached to individual or paired connector/fiber.

Field testing information of each Fiber-optic Drop cable (fully assembled) shall in accordance with subsection 662-3.04, Field Testing and Performance of Fibers. Documentation of testing shall be in accordance with subsection 662-3.05, Documentation of Testing.

Fiber-optic drop cables shall be equipped with:

1. At least, twelve (12) optical fibers or as shown on the plans.
2. Fiber-optic connectors shall be:

a. Compatible with the equipment being used for fiber strands with preset usage.

b. In accordance with subsection 662-3.07, Connectorization.

c. Factory installed unless otherwise allowed by Engineer.

1. Drop Cable Fan-out Kits:

a. heavy-duty Spider design.

b. Install fan-out kits for all connectorized ends to build up to a 3 mm jacket.

4. Tubing that is 900 µm or 3 mm fan-out as required by the application.

5. Buffer tubes shall protected by the cable sheath or fan out kit. Exposed buffer tubes are not acceptable.

6. Individual fiber strands shall be protected by aramid fiber tubes.

**662-2.05 SINGLE-MODE OPTICAL FIBERS.** Single mode (SM) fibers utilized in the cable shall be fabricated from 100 kpsi proof stress glass and primarily composed of silica which shall provide a matched clad index of refraction (n) profile and the following physical and performance characteristics:

1. Core Diameter: 8.3µm

2. Maximum Attenuation: 0.4/0.25 dB/km at 1310/1550 nm, respectively

3. Maximum Dispersion: < 3.2 ps/nm-km from 1285 nm to 1330 nm; < 17 ps/nm‑km at 1550 nm

4. Dispersion Wavelength (ZWD): 1301.5 to 1321.5 nm

5. Zero Dispersion Slope: 0.092 ps/nm2-km

6. Cladding Diameter: 125 +/- 1.0 µm

7. Core-to-Cladding Offset (concentricity): < 0.8 µm

8. Cladding Non-Circularity: < 1.0 percent

9. Fiber Coating Diameter: 245 +/- 10 µm

10. Secondary Coating: 900 µm (as specified for breakout cable/kits, distribution cable, pigtails and patch chords only)

11. Fiber Colored Diameter: 250 +/- 10 µm nominal

12. Mode-Field Diameter: 9.3 +/- 0.5 µm at 1310 nm; 10.5 +/- 1 µm at 1550 nm

13. Attenuation Uniformity: No point discontinuity greater than 0.10 dB at either 1310nm or 1550nm

14. Cutoff Wavelength: <1260 nm

15. Maximum End-to-End Attenuation per cable length 15 dB.

16. Maximum cable outside diameter: 0.5-inch

17. Fiber Polarization Mode Dispersion (PMD): 0.5 ps/km1/2

18. Proof Test: All Optical fibers shall be proof tested by fiber manufacturer

19. Attenuation at Water Peak: The attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/km.

20. Numerical Aperture: 0.13

**662-2.06 FIBER-OPTIC MANHOLES AND VAULTS.**

1. General.

1. Shall be spaced at intervals no greater than 2,500 feet (800-1000 feet typical). In extreme cases where conduit has no bend as permitted by the Engineer, 5,280 feet is allowable (conduit shall be lubricated with no bends).
2. Shall be installed at locations where the cumulative, conduit bends, measured from the last manhole/vault, exceed 360 degrees.
3. Are not required for change in conduit installation method.
4. Shall not be greater than 5 feet in depth as measured from the lid to the base.
5. Covers shall meet the Heavy Duty requirements of AASHTO M306, Drainage, Sewer, Utility, and Related Castings.
6. Finished grade shall be in accordance with pertinent sections of section 660-3.04, Junction Boxes. Manholes and vaults shall be located in the field to avoid drainage swales. Do not install manholes or vaults within the traveled way or shoulders.
7. When communication conduit is located in the same trench as conduit intended for other purposes (i.e., electrical circuits), manholes shall be offset a minimum of 2 feet from the conduit trench.
8. A fiber-optic cable support assembly shall consist of multiple brackets, racks, and/or rails required to suspend the required surplus cabling and any splice enclosures for a single vault. The support assemblies shall be recommended and approved by the manufacturer of the fiber-optic cable and splice enclosure. The support assembly shall be made from or coated weather resistant material such that there is no corrosion of the supports. The support assemblies shall be anchored to the existing wall using stainless steel hardware. The fiber-optic cable support assemblies shall be incidental to the manholes/vaults.
9. Void areas between openings and conduit shall be filled with a self-curing caulk that will provide a permanent, flexible rubber seal. The caulk shall be unaffected by sunlight, water, oils, mild acids, alkali, mildew and is non-flammable. The material shall provide a permanent bond between the conduit entering the manhole/vault and the polymer concrete. The caulking shall be gray in color.
10. All openings in manhole/vaults shall be machined at the time of fabrication, as shown on the plans, or punch-driven at the time of placement. Openings shall be sized to facilitate conduit called for in the plan. Make core drilled holes in vaults shall not be more than ¼ inch larger than the conduit diameter. Do not “knock out” thin wall sections.
11. Manhole/vault walls that receive only one or no conduits shall be provided with at least one 5‑3/4 inch diameter knockouts for future multi-duct installation. The knockouts shall be aligned across from each other.
12. Provide one electronic ball marker in each vault and manhole in accordance with Section 660-3.04, Junction Boxes.

2. Manholes.

1. All openings in Type 1 manholes shall be cored or blocked out at the time of fabrication, or cored at the time of placement. Where conduit is terminated in a manhole, the coring shall be no larger than 1/2 inch from each side of conduit.
2. Shall be constructed on top of 12 inches of porous backfill material (subsection 703-2.10).
3. Shall have a 1‑inch-diameter drain hole in the base.
4. Proposed manholes shall be fabricated with fiber-optic cable support assemblies, as specified herein, and as shown on the plans. The cost to provide the fiber-optic support assemblies shall be incidental to manholes.
5. Type M covers are required for manholes when installed within terrace, median or off-roadway areas. Type K covers are required for manholes when installed in the roadway.

3. Vaults.

1. Shall be 30 x 48 inches and shall have an effective height of 57 inches (one 24‑inch tall stackable vault and one 36‑inch stackable vault with a 3‑inch overlap).
2. Shall be constructed on top of 12 inches of porous backfill material (subsection 703-2.10).
3. The vault lid shall have a minimum design load of 15,000 pounds and shall have a permanently recessed logo that reads "TRAFFIC.” The vault lid shall have two (2) 1/2‑inch x 4‑inch pull slots. The lid surface shall have a coefficient of friction of 0.50 in accordance with ASTM C1028.
4. The vault and vault lid shall be constructed of the polymer concrete material, "cosmopolite" and be gray in color. The vault lid shall have steel rebar or mesh added to it so the vault can be easily found with a metal detector under heavy snow. The steel rebar and mesh shall be completely enclosed within the lid such that grounding is not required. The added steel shall have 1 in of cover and not add excess weight to the lid.
5. Manufacturer approved gasketing to resist water from entering the vault shall be installed between the lid and the top 24‑inch-deep stackable vault.
6. The vault lid shall be secured to the vault with two 3/8‑inch 16 UNC stainless steel pentahead bolts in which to lock the lid and shall include the appropriate stainless steel washers.

**662-3.01 CONSTRUCTION REQUIREMENTS.**

1. Fiber-optic Cable. All splicing, testing and terminating of optical fibers shall be performed by a technician in accordance with subsection 662-3.02, Certified Fiber-optic Technician.

Physical condition of the cable upon receipt shall be recorded as outlined in subsection 662-3.05, Documentation of Testing. Cable reel shall be inspected for nails, staples and other materials that might otherwise kink or damage the cable when unreeling. All fibers should be tested upon receiving cable. The Contractor shall assume full responsibility of cable that is damaged if testing is not performed after receiving cable.

A detailed construction plan and installation procedure shall be submitted and approved by the Engineer before cable installation. Cable shall only be spliced at designated splice points as specified on the plan.

Before installation, all cables shall be inspected to be free of damage (nail or staple holes, jacket tears, kinks, etc.), material defects, manufacturing defects, and dimensional non-uniformity that would:

* Interfere with the cable installation using accepted cable installation practices.
* Degrade the transmission performance and environmental resistance after installation.
* Inhibit proper connection to interfacing elements.
* Otherwise yield an inferior product.

Take all necessary precautions to protect reeled cable from possible damage while unattended. Exposed cable shall be protected at all times from vehicular and public traffic. If cable ends are exposed and unattended, cable caps shall be taped onto cable ends to prevent ingress of moisture into the cable.

When cable is installed by pulling, a swivel and woven cable grip designed for fiber-optic cable shall be used. Materials for lubricating shall be utilized when pulling. Cable shall be pulled in one continuous run. Splicing is not allowed until the entire length of cable is installed. Cable shall be pulled in multiple runs when 2 or more 90o bends occur in the run. One continuous cable pull shall not contain more than one 90o bend.

Cable installation in conduit (duct) systems shall conform to manufacturer approved methods of jetting or pulling. Cable shall not be kinked or forced abruptly against conduit edge when pulling cable from conduit ends. Cable feed systems (reels, rollers, guide, tubes etc.) shall be used to install or retrieve cable from conduit ends in vaults, manholes, or junction boxes.

Equipment shall be provided to monitor tensile forces on long cable runs. Monitoring equipment shall measure pulling tension as it occurs and record the maximum tension incurred during the pull. Prior to starting the cable installation, provide manufacturer’s documentation to the Engineer indicating the maximum tension (short term loading and long term loading) when pulling the cable during the installation. Maximum limits shall not be exceeded under any circumstances.

Unless cable is assisted by jetting or winching, lengthy cables requiring multiple pulls shall be coiled in a “figure-eight” pattern. Coiled cable will be staged at intermediated access points to avoid twisting of cable. The figure-eight patterns shall be approximately 15 feet in length. Cardboard shims shall be installed between cable layers at the crossover of the “figure eight” to relieve pressure on the cable. Fiber-optic cable lengths greater than 100 ft shall not be coiled in one continuous direction.

Minimum bend radii (20 x diameter of the cable with loading, 10 x cable diameters without loading) on the cable shall not be exceeding at any time.

Temporary aerial installation methods shall be consistent with manufacturers approved method.

Excess fiber cable slack shall be stored in vaults and manholes on hooks in accordance with the plans. Cable slack shall be neatly coiled around the inside perimeter of manholes and vaults and shall be supported by cable brackets. Cable slack shall be supported as to not interfere with access into manholes and vaults. Excess fiber cable slack shall be provided as follows:

* Approximately 100 feet per manhole and vaults.
* 50 feet per junction box.
* 6 feet per controller cabinet.

All fiber-optic cable shall be installed with marking tape, copper wire tracer and above ground markers.

2. Vaults. Vaults shall not be placed near drainage collection areas or where vehicle traffic is anticipated. To the extent possible, vaults shall be placed so that they are accessible by service vehicles driving close to them.

Brackets for splice enclosures shall be mounted as per vault manufacturer recommendations. Mounting equipment for cable or splice closures shall not fully penetrate the vaults in order to prevent water intrusion.

Where applicable, conduits shall be terminated in vaults to allow for proper grounding and bonding of metallic conduit. Multi-duct conduit termination kits shall terminate at vaults inside wall (or slightly into the vaults interior) to the extent possible.

Conduit, conduit terminations, and caulking shall be allowed to fully cure as per the manufacture’s specification before backfilling vault. Openings required to install special or directional conduit shall be sealed with manufacturer approved termination kit.

3. Polyethylene Conduit. Install polyethylene conduits at 36 inches below finished grade in trenches separate from those used to install traffic signal and highway lighting systems.

Keep junction boxes and ends of conduit covered unless pulling conductors.

Backfill requirements shall be in accordance with Section 204.

Conduit shall be installed in one continuous run between access points.

Conduit shall be installed as linear as possible so as to maximize pulling distances dictated by fiber optic tension requirements. Bends in conduits shall be minimized to the extent possible.

Directional changes in continuous conduit runs shall not exceed 90°. Manholes, junction boxes, or vaults shall be provided where 90°directional changes are exceeded.

Required bends, sweeps, fittings, and parts necessary to connect the conduit to vaults, manholes, and junction boxes shall be subsidiary and will not be paid for separately.

Flexible bend sections are not allowed.

Conduit bending radii shall not exceed the minimum-bending radius as dictated by fiber-optic cable requirements.

Where lubrication has not been provided in existing conduit, conduits shall be lubricated according to cable manufacturer recommended procedures. Lubrication, when required shall be suitable to avoid long-term cable jacket damage.

Conduit ends shall be protected at all times from migration of foreign materials and rodents during and after shipment and during installation. Pre-lubricated conduit with exposed ends will be rejected. Where provided, non-lubricated conduits left unprotected shall be cleaned before cable installation.

Termination kits shall be installed immediately upon conduit installation.

The conduit fill ratio shall not exceed 0.65 where,

Fill Ratio = ∑ Cross Sectional Areas of Cable(s) / Inner Conduit Cross Sectional Area

The recommended maximum fill ratios are as follows:

|  |  |
| --- | --- |
| **Fill Ratio** | **Number of Fiber Optic Cables within Conduit** |
| 0.31 | 2 cables |
| 0.40 | 3 cables |

When installing three cables into a conduit, ensure that the ratio of the raceway (inside diameter) to the individual cable (outside diameter) does not fall between 2.8 and 3.2, or jamming may occur. Reference NEC Ch. 9, Table 1, Informational Note No. 2.

Terminate all conduit entering vaults or manholes 3 inches past the inside walls of vaults or manholes.

A detectable polyethylene marking tape with the words “Buried Fiber-optic Cable” (or similar) shall be laid horizontally above the conduit, 12 inches below final grade. The marking tape shall be at least 6 inches wide, within 2 inches of the trench width, at least 4 mils thick and orange in color. Two strips shall be laid side by side under all road crossings.

Install above ground markers at 400-foot intervals. Markers shall be orange flexible delineators reading “Fiber-optic Interconnect System” (or similar).

Use care during compaction operations to prevent damage to junction boxes and conduits. Remove and replace items damaged during the backfill and compaction operations at no additional cost to the Department.

Special termination kits shall be provided by the conduit manufacturer for terminating the conduit in manholes and vaults. The kits shall seal ducts from contamination, rodents, and flooding. Kits shall be designed to fit the number and size of cable(s) within the conduit and shall allow cable entry and exit within vaults or manholes without inducing stress on the fiber-optic cable or damaging cable jacket.

A polyethylene pull rope shall be installed in all empty conduits for future cable installations. The rope shall be rated for 1,000 lbs or greater and shall not be less than ¼ inch in diameter.

All sharp objects (rocks, debris, etc.) shall be removed from the conduit trench before backfilling. The first 6 inches of backfill shall be free of rocks exceeding 1 inch maximum dimension.

4. Multi-duct Conduit Multi-cell conduit shall be placed in an open trench and backfilled in underground installations unless otherwise called for in the plans.

Multi-duct shall be 36 inches below grade (30 inches minimum) or as specified in the plans. Conduits shall be located as close to the R/W as possible and shall run up and down slopes 4:1 or steeper (longitudinally to the slope) as opposed to running along the slope.

Backfill requirements shall be in accordance with Section 204.

All fiber-optic cable shall be run in conduit, except for overhead fiber cable and where otherwise called for in the plans.

Conduit shall be installed in one continuous run between access points defined in the plans.

Conduit shall be installed as linear as possible so as to maximize pulling distances dictated by fiber-optic tension requirements. Bends in conduits shall be minimized to the extent possible.

Continuous conduit runs between terminated ends shall not contain more than 90° bend.

Directional changes in continuous conduit runs shall not exceed 90°. Manholes, junction boxes, or vaults shall be provided where 90°directional changes are exceeded.

Required bends, sweeps, fittings, and parts necessary to connect the conduit system to vaults, manholes, and junction boxes shall be incidental to this specification (or other items of work) and will not be paid for separately.

Flexible bend sections are not allowed.

Multi-cell or individual mainline conduit runs shall not exceed 3-foot bending radii (6-foot typical) or manufacturer’s minimum radius whichever is larger.

Multi-duct conduit bending radii shall not exceed the minimum-bending radius as dictated by fiber-optic cable requirements.

Only one type of conduit shall be used in any one continuous run between conduit terminations vaults or manholes.

Where lubrication has not been provided in existing conduit, conduits shall be lubricated according to cable manufacturer recommended procedures. Lubrication, when required shall be suitable to avoid long-term cable jacket damage.

Conduit ends shall be protected at all times from migration of foreign materials and rodents during and after shipment and during installation. Pre-lubricated conduit with exposed ends will be rejected. Where provided, non-lubricated conduits left unprotected shall be cleaned before cable installation.

Termination kits shall be installed immediately upon conduit installation.

Above ground markers shall be orange flexible delineators reading Fiber-Optic Interconnect System, installed at 400-foot intervals.

The conduit fill ratio shall not exceed 0.65 where,

Fill Ratio = ∑ Cross Sectional Areas of Cable(s) / Inner Conduit Cross Sectional Area

The recommended maximum fill ratios are as follows:

|  |  |
| --- | --- |
| **Fill Ratio** | **Number of Fiber Optic Cables within Conduit** |
| 0.31 | 2 cables |
| 0.40 | 3 cables |

Terminate all conduit entering vaults or manholes 3 inches past the inside walls of vaults or manholes.

A polyethylene pull rope shall be installed in all empty conduits for future cable installations. The rope shall be rated for 1,000 lbs or greater and shall not be less than ¼ inch in diameter.

A detectable polyethylene marking tape with the words “Buried Fiber-optic Cable” (or similar) shall be laid horizontally above the conduit, 12 inches below final grade. The marking tape shall be at least 6 inches wide, within 2 inches of the trench width, at least 4 mils thick and orange in color. Two strips shall be laid side by side under all road crossings.

All sharp objects (rocks, debris, etc.) shall be removed from the conduit trench before backfilling. The first 6 inches of backfill shall be free of rocks exceeding 1 inch maximum dimension.

**662-3.02 CERTIFIED FIBER-OPTIC TECHNICIAN.** The Fiber-Optic Technician shall have attended and successfully completed at least one four-day "Installation of Fiber-optic Products School." This school shall be conducted by a major manufacturer of fiber-optic products and encompasses all aspects of fiber-optic technician certification.

Employ only technicians demonstrating a minimum of two years work experience with the splicing, termination, and testing of fiber-optic cable.

The approved technician shall provide evidence of completed courses within one week before the beginning of construction. The Engineer reserves the right to revoke the approval of any technician not demonstrating the skill and knowledge to perform at accepted industry standards or to the quality required in these specifications.

**662-3.03 TESTING AND PERFORMANCE BY MANUFACTURER.** All outdoor cable installations shall meet or exceed requirements of the Fiber-optic Test Procedure (FOTP) criteria referenced in RUS 7 CFR 1755.9 and Bulletin 1753f-601 (PE-90) and these specifications.

Following specifications shall apply to the appropriate Fiber-optic Test Procedures (FOTP):

1. [TIA-455-3-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2D455%2D3%2DA), FOTP-3 “Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components”: The average change in attenuation at extreme operational temperatures (-400 F to +1600 F) shall not exceed 0.05 dB/km at 1,550 nm for single-mode fiber. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.15 dB/km at 1,550 nm.

2. [TIA-45-82-B](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2D455%2D82%2DB), FOTP-82, “Fluid Penetration Test for Fluid-Blocked Fiber-optic Cable.” When a one-meter static head or equivalent continuous pressure is applied at one end of one-meter length of un-aged cable for 24 hours, no water shall leak through the open cable end. When a one-meter static head or equivalent continuous pressure is applied at one end of one-meter length of aged cable of one hour, no water shall leak through the open cable end. The aging cycle is defined as exposing the cable to 850C for 168 hours and two cycles of –400C to +700C with cable held at these temperatures for 24 hours. At the end of this cycle, the cable will be decreased to +230C and held for 24 hours. The water penetration test is completed at the end of the 24 hours hold period.

3. TIA/EIA-455-81-B, FOTP-81, “Compound Flow (Drip) Test for Filled Fiber-optic Cable”: The cable shall exhibit no flow (drip or leak) of filling and/or flooding material at +650C.

4. [TIA/EIA-455-41-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D41%2DA), FOTP-41, “Compressive Loading Resistance of Fiber-optic Cables”: Ten percent of the fibers shall not experience a magnitude of attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The magnitude of the attenuation change shall be within the repeatability of the measurement system for the remaining 90 percent of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after test load is removed.

5. [TIA/EIA-455-104-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D104%2DA), FOTP-104, “Fiber-optic Cable Cyclic Flexing Test.” Change in attenuation shall not exceed 0.1 dB at 1550 nm for single mode fiber. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90 percent of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10 percent of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.

6. [TIA/EIA-455-25-C](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D25%2DC) FOTP-25, “Repeated Impact Testing of Fiber-optic Cables and Cable Assemblies.” The magnitude of the attenuation change shall be within the repeatability of the measurement of 90 percent of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10 percent of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.

7. [TIA-455-33-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2D455%2D33%2DA) FOTP-33, “Fiber-optic Cable Tensile Loading and Bending Test.” While subjected to a minimum load of 600 lbf, the cable sample shall be able to withstand a twist of 360 degrees in less than 3 meters of length. The magnitude of the attenuation change shall be within the repeatability for the measurement system for 90 percent of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10 percent of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The cable shall not experience a measurable increase in attenuation when subjected to the rated residual tensile load, 200 lbf.

8. [TIA/EIA-455-85-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D85%2DA) FOTP-85, “Fiber-optic Cable Twist Test”: The magnitude of the attenuation change shall be within the repeatability for the measurement system for 90 percent of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10 percent of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The average increase in attenuation for the fibers shall be <0.40 dB at 1300 nm. The cable jacket will exhibit no cracking or splitting under a 5x magnification after completion of test.

9. [TIA/EIA-455-181](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D181) FOTP-181, “Lightning Damage Susceptibility Test for Optic Cables with Metallic Components.”

10. [TIA/EIA-455-37-A](http://www.tiaonline.org/standards/standards/search_results2.cfm?document_no=TIA%2FEIA%2D455%2D37%2DA) FOTP-37, “Low or High Temperature Bend Test for Fiber-optic Cable”.

11. TIA/EIA-455-98, FOTP-98-A, “Fiber-optic Cable External Freezing Test”.

**662-3.04 FIELD TESTING AND PERFORMANCE OF FIBERS.** All testing of optical fibers shall be performed by a Certified Technician as described in subsection 662-3.02, Certified Fiber-Optic Technician.

The Contractor shall schedule the date, time, and location of any tests required by this specification with the Engineer and designated traffic signal technician at least 72 hours before performing the tests. The designated traffic signal technician and the Engineer, or designee, shall be present when the tests are conducted. The Certified Technician shall demonstrate clearly how the tests are being performed and shall be made available to discuss testing strategies with designated traffic signal technician and the Engineer.

Tests shall be conducted using standard operating procedures as defined by the manufacturer of the test equipment.

The following tests shall be conducted before the cable is deactivated by designated traffic signal technician and after the cable has been installed, spliced and connectorized. Test results shall be submitted in accordance with subsection 662-3.05, Documentation of Testing. Tests shall be performed before any permanent equipment connections. All fibers shall be tests for continuity, events above 0.05 dB and total attenuation of the cable. If the fiber-optic cable installed is connected to an existing fiber-optic cable, perform installation tests the installed cable and all existing fibers to which it is spliced or connected:

1. End-to-end OTDR (Optical Time Domain Reflectometer) Testing. This test shall be conducted to identify attenuation associated with each fiber. Traces shall be provided for each operational wavelength for the type of fiber in the system to indicate attenuations and their locations.

A Certified Technician utilizing an OTDR and Optical Source/Power Meter shall conduct the tests after installation. The Technician shall conduct the test according to the standard operating procedure as defined by the manufacturer of the test equipment.

To eliminate or shift the “dead zone,” either a factory patch chord or “fiber launch box” of length greater than the dead zone shall be used.

Measurement shall be conducted for 1310 nm and 1550 nm for single mode fiber.

2. Attenuation Test. All fiber links shall be tested with a standard power-meter test and all attenuation shall be documented. For every fiber installed or connected to under this Contract, perform end to-end attenuation test.

For the test, use a calibrated optical source and power meter using the standard three-stage procedure. Determine acceptable link attenuation by the cumulative value of standard losses based on length, number, and type of splices and connectors.

Provide test results of the fiber-optic cable that demonstrate the dB/km loss does not exceed +3 percent of the factory test or 1 percent of the cables published production loss. The Engineer may elect to allow bi-directional averaging of OTDR testing due to splice loss core alignments. Fiber-optic cable loss limits shall be in accordance with the following:

a. No event shall exceed 0.10 dB. If any event is above 0.10 dB, repair or replace that event location.

b. Total dB loss of a cable fiber less events shall not exceed +3 percent of the factory test or 1 percent of the manufacturer’s published production loss at 1310 and 1550 nm. Cable fiber loss shall not exceed Maximum Attenuation Limits as defined in subsection, “Single Mode Fiber-optic Cable.”

Cable Fiber Loss (dB) = Total Loss (dB) - ∑ events (dB)

Cable Fiber Loss (dB/km) = Cable Fiber Loss (dB)

Cable Fiber Length (km)

c. Where total or event losses exceed these specifications, replace or repair that cable run and assume all expenses, both labor and materials. Elevated attenuation due to exceeding pulling tension during installation will require replacement of cable at the Contractor’s expense.

d. Fusion splice losses shall not exceed 0.10 dB per fiber. Mechanical splices, where allowed, shall not exceed 0.30 dB.

e. Each connection, after factory assembled, shall not exceed the maximum loss of 0.50 dB (typical loss is 0.25dB) and optical return reflective loss of <-0.45dB. A connection consists of two mated connectors.

f. If event losses exceed these specifications, event locations shall be replaced or repaired without additional cost reimbursement for expenses.

g. If total loss exceeds these specifications, Fiber-optic cable shall be replaced or repaired without reimbursement for expenses.

h. All fibers within the cable shall be tested and proven usable in accordance with these specifications.

**662-3.05 DOCUMENTATION OF TESTING.** Upon completion of the field test, the Contractor shall provide three copies of all documentation to the Engineer. Except for standard bound materials, documentation shall be neatly bound in 8.5” x 11” (size A4) documentation in logical groupings. Bindings shall be of either the 3-ring or plastic slide-ring type. Permanently and appropriately label each such bound grouping of documentation. The Engineer shall be provided with two paper copies of all documentation and a copy of the test result in .pdf to designated traffic personnel. Use labeling scheme established in 662-3.07.2.

Documentation from manufacturer shall include manufacturer data of cable and fiber including:

* Optical performance (OTDR) including dB/km loss measured at 1310 and 1550 nm for single mode.
* Manufacturer’s name
* Date of manufacture
* Index of Refraction
* Cable ID
* Connector losses and bandwidth/dispersion data

Documentation of field testing shall include a map. This map shall show:

* Cable part numbers
* Manufacturer
* Cable length markings, including slack length markings at all vaults and junction boxes.
* As-built cable routing
* Location of splice points and hardware at each splice point location (see below under testing also).

Documentation shall include the information below for end-to-end testing, splice loss measurements, OTDR traces.

The documentation shall be neatly tabulated for each field test and shall include the following:

1. Cable and Fiber Identification.

* Manufacturer
* Cable ID
* Cable Type
* Fiber ID (include tube and fiber color)
* Cable Location – begin and end point
* Operator Name
* Date and Time
* Date of installation
* Fiber Count

2. Setup Parameters.

* Wavelength
* Pulse Width (OTDR)
* Refractory index (OTDR)
* Jumper and/or Launch Box Length
* Range (OTDR)
* Scale (OTDR)

3. Test Results.

a. OTDR Test:

* Total Fiber Trace (mile)
* Splice Loss/Gain
* Measured Length (Cable Marking)
* Provide traces on a CD to Engineer
* Total Length (OTDR) (mile)
* Events ≥ 0.05 dB. Trace vertical scale shall allow easy identification of 0.05dB loss.
* Backscatter

1. End-to-End Attenuation Test:

* Length
* Number and type of splices and connectors
* Link Attenuation

Fiber-optic cable test results shall demonstrate that dB/km losses do not exceed limits in accordance with subsection, 662-3.04 Field Testing and Performance of Fibers.

**662-3.06 PACKAGING.** Fiber-optic cables shall be shipped on wooden reels. The diameter of the drum shall be a least 20 times the diameter of the cable. The following information shall be either stenciled on the reel or on a weatherproof tag firmly attached to the reel or a combination of both in order to trace the manufacturing history of the cable:

* Optical Cable
* Number of Fibers
* Date cable was tested
* Non-armored
* Year of cable manufacture
* Name of cable manufacturer
* Gross weight
* Part Number
* Handling Instructions
* Arrow indicating cable wind direction

Cable data sheets shall be supplied to Engineer containing the following:

* Manufacturer Name
* Cable ID Number and fiber type
* Factory Order Number
* Cable Length
* Factory measured attenuation (each fiber)
* Index of Refraction
* Bandwidth Specification (where applicable

Sufficient cable length, in addition to the quantities shown on the plan, shall be provided for testing. Both ends of the cable shall be available for testing. Pack one continuous length of fiber-optic cable per reel; maximum overage shall not exceed 10 percent unless approved by The Engineer. Compensation will not be granted for overage or excess cable needed for testing and installation methods.

Package the cable for shipping to prevent the cable from coming loose in transit. Secure the outer and inner end of the cable. Cover the reel with thermal wrap to protect the cable. Apply end seals to each end of the cable to prevent moisture and from entering the cable.

Include the manufacturers test documentation with each reel. This documentation indicates the attenuation of each cable fiber in dB/km (dB/ft), measured at 1310 and 1550 nm for single mode fiber.

**662-3.07 CONNECTORIZATION.**

1. Connectors. This subsection shall consist of furnishing and installing connectors (in-line or terminated ends), attenuators as required in the plans, or as required for working fiber-optic system. All connectors shall be installed by a Certified Technician as described in this specification.

Hybrid adaptors shall not be used to connect two different connectors. Hybrid jumpers with different connectors at each end of cable shall interface with equipment or cables with different connectors where needed.

Connectors shall be LC or SC connectors for single mode fibers. FC and ST connectors are allowed only where compatibility with equipment is required for fibers with a preset usage. These must be approved by the Engineer.

Connectors shall be installed with ceramic ferrules. The fibers shall be secured within ferrule with epoxy, heat set or air dried, as specified by the manufacturer. Machine polished mating faces shall be provided. Install connectors per manufacturer application and recommendations, including proper termination to the outer tubing (900 micron, 3 mm fan-out) as required by the application. Connectors shall be rated for operating temperatures of ‑400 F to 1600 F. Connectors shall be factory-installed for all applications except where approved by the Engineer.

If connections are made, connectors shall be cleaned once before the first connection and once every time thereafter before reconnection. Connectors shall be cleaned according to manufacturers recommended practice.

Connector losses shall not exceed limits as described in subsection 662-3.04, Field Testing and Performance of Fibers. Repeatability of keyed connectors shall not exceed 0.2 dB.

Boots shall be provided for durable cable strain relief.

Dust caps shall be provided and installed at all times when connector is not in use.

2. Patch Panels. Terminate and secure the number of fibers splices specified by the engineer from one buffer tube in the cable to a fiber optic drop cable located in the traffic signal controller cabinet that the fiber is shown to enter in the plans. Each patch panel will connect to only one fiber cable.

Ensure the fibers used throughout the system are matched correctly to allow for communications from one cabinet to the next in the system.

Ensure that the patch is compatible with the fiber optic cable/cables being terminated and color-coded to match the optical fiber color scheme.

All patch connectors shall be clearly labeled including the cable route, buffer and color. The panel shall have the number of LC type or SC type connectors as indicated in the plans or as directed by the Engineer.

All installed patch panels shall include documentation regarding the identification, route, buffer and color of each patch panel connector at that location.

Place at least one copy of this information alongside the installed equipment or in the controller cabinet door pouch.

**662-3.08 ATTENUATORS.**Attenuators shall be provided at no extra payment to the Contractor to achieve the desirable signal loss. Attenuators shall only be installed on the receiving end closest to the originating transmission (typically closest to the Traffic Signal Management Center).

Connecting ends shall be compatible to connectors described in subsection 662-3.07, Connectorization.

**662-3.09 SPLICES.** Two weeks before the start of the fiber-optic cabling installation, the Contractor shall submit the following:

* Proposed locations of the mainline spliced points for review by the Engineer designated traffic Traffic personnel.
* Proposed process to be used for splicing including procedure.
* Cleave tool and specific fusion splicer to be used.

1. All Splices.

a. Splicing and termination of optical fibers shall be performed by a Certified Technician as described in 662-3.02 Certified Fiber-Optic Technician.

b. Splicing shall only be allowed in areas as designated on the plans or as approved by the Engineer.

c. Splices and stripped cable shall be housed by a fiber splice closure (FCS) in designated locations shown on the plans.

d. Cable ends involved in splicing shall match colors of the fibers and buffer tubes to the extent possible.

e. No stresses shall be placed on the fibers before or after the splice is completed.

f. Splice loss shall not exceed limits as described in subsection 662-3.04, Field Testing and Performance of Fibers

g. Fan-out kits are required for splices to multiple fibers in the buffer tubes for single mode fiber.

1. Splices shall be located in the center of the slack cable in manholes or vaults.

i. All splices shall be fusion splices protected with heat shrink sealant (RTV fusion splices). 60 mm heat shrink protectors shall be used. Mechanical splices are not allowed.

1. End-To-End Splices.

a. End-to-end splicing shall be performed as per manufacturer instructions for the supplied splice closure units.

b. End-to-end fusion splicing shall be conducted for any disturbed fibers within the disturbed buffer tube(s). Remaining buffer tube(s) that are not required for splicing shall be undisturbed and protected in the Splice Closure.

c. End-to-end fusion splices shall be used on mainline splices for all fibers (72 fibers typical) within the fiber-optic cable where designated in the plans.

3. Fusion Splices.

a. All splices to be fusion splices unless otherwise indicated on plans.

b. Fusion splices shall be made with a portable fusion splicer, capable of AC or internal battery-powered operation. The unit shall be able to splice fibers specified herein with 250 micrometer coating and 900 micrometer coating with little or no modification in the field. The fusion splicer shall be capable of full battery recharge in an eight-hour charging period.

4. Drop Fiber Splices.

a. Drop fiber splices (12 fiber typical) and drop cables (12-fibers typical) shall be used for connectivity between a primary mainline fiber-optic cable (72-count typical) and field devices (i.e., traffic signal controller cabinet) as identified in the plans.

b. Drop fiber splices shall consist of breaking out the required buffer tube(s) from the fiber-optic trunk cable (12-count typical) and fusion splicing the appropriate number of fibers to the fiber-optic drop cable (12 fibers typical). Remaining undisturbed fibers, if any, shall be protected in the splice tray.

1. Drop fiber splice shall be performed for each device location at locations shown on the plans. Splicing shall be performed as per manufacturer’s recommended procedure approved by the Engineer.

**662-3.10 SPLICE CLOSURES.** Fiber-optic splice closures (FSC) shall be installed in the locations on the plans at designated splice locations. Closures shall contain splice trays or organizers that contain the splices.

Before installation, the Contractor shall provide certification from the manufacturer that the splice closures conform to the specifications and test procedures.

1. Closures.

a. Splice closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress, and flex temperature extremes. This will be demonstrated by successfully passing factory test procedures and these specifications. The closure shall prevent the intrusion of water without the use of encapsulates.

b. Closure re-entry and subsequent reassemble shall not require specialized tools or equipment; these operations shall not require the use of additional parts.

c. Splice closures shall provide housing and storage for all splices, stripped cable, and undisturbed buffer tubes. All splices enclosures shall provide protection and strain relief to optical fibers. Splice closures shall be suitable to handle straight, butt or branch splices.

d. Splice closures requiring greater than 48 splices shall provide for the following requirements:

1) 6‑inch diameter by 22‑inch length.

2) One, six-cable entry end plate.

3) One blank end plate.

4) All endplates shall be 3-section, pre-molded, and suitable for use with Coyote closures.

5) Required accessories to complete splice.

6) One future cable entry kit for each splice closure.

e. Closures shall be provided with external valve pressurization ports. Closure shells shall be glass-filled high-density thermoplastic that effectively withstands corrosion; high impact and freeze thaw stresses.

f. Closure endplates shall be interchangeable with each size of closure available from the closure supplier.

g. Where additional access is required into an existing splice closure, replace the existing endplate with an endplate suitable for the task.

h. Splice closures shall accept up to six cables in a butt configuration, and 12 for in-line configuration without special adaptors.

i. Closure shall contain a permanent neoprene gasket seal.

j. All closures, including closing hardware, shall be from the same supplier.

k. External Shrader valve pressurization port shall be supplied.

l. The splice closure shall be designed and equipped with the necessary mounting hardware to be attached to the side of the manhole or vault, and to be suspended with sufficient clearance at each end for acceptable cable bends.

m. All cables shall be properly dressed and affixed to rails or racks within the manhole or vault. No cables or enclosures will be permitted to lie on the floor.

n. Fiber-optic cables shall be restrained within the splice enclosure such that there is no discernible tensile force on the optical fiber.

o. The splice closure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies and space for excess or unspliced fiber. Splice organizers shall be re-enterable and re-sealable.

p. The closure shall be capable of accommodating a minimum of 2 splice organizer trays, which shall accept mechanical, fusion, or multi-fiber array splices.

q. Splice closures shall contain a basket allowing fiber buffer tube storage of exposed buffer tubes. The splice case shall be UL rated.

r. The closure shall be installed according to the manufacturer’s recommended guidelines.

2. Splice Tray.

a. One splice tray shall be designed to hold a minimum of 12 mechanical splices. A second splice tray (for Fiber-optic Drop Cable splicing) shall be designed to hold a minimum of 12 fusion splices. All other splice trays provided in the closure shall be designed to hold fusion splices of 12 (typical) up to 36 splices. Total number of splices supported shall be 96 splices.

b. Splice trays shall allow for optical fiber storage as recommended by the manufacturer. The splice closure shall have provisions for controlling the fiber bend radius (1.5 inches typical) to a minimum as required by the manufacturer.

**662-3.11 SPLICE CLOSURES -FACTORY TESTING REQUIREMENTS.** The construction and testing of the fiber-optic splices and splice enclosures shall comply with all applicable industry standards including Electronic Industry Standards (EIA/TIA), ANSI and ASTM standards.

Splice closures shall meet the following test requirements:

1. Compression Test. The closure shall not deform more than 10 percent in its largest cross-sectional dimension. When subjected to a uniformly distributed load of 300 lbf (1335 N) at temperatures between 00F and 1000F (–180C and +380C). The test shall be performed after stabilizing at the required temperature for a minimum of 2 hours. It shall consist of placing an assembled closure between two flat paralleled surfaces, with the longest closure dimension parallel to the surfaces. The weight shall be placed on the upper surface for a minimum of 15 minutes. The measurement shall then be taken with weight in place.

2. Impact Test. The assembled closure shall be capable of withstanding an impact of 21 ft-lbf (28 N-m) at temperatures of 100F and 1000F (-120C and 380C). The test shall be performed after stabilizing the closure at the required temperature for a minimum of 2 hours. The test fixture shall consist of a 20 lb (9 kg) cylindrical steel impacting head with a 2-inch (5 cm) spherical radius at the point where it contacts the closure. It shall be dropped from a height of 12 inches (30 cm). The closure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5 percent.

3. Cable Gripping and Sealing Testing. The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550 nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers, before and after assembly. This will determine the effects of the cable gripping and sealing hardware on the optical transmission of the fibers.

4. Vibrations Test. The fiber splice organizers and splice retaining hardware shall be tested per EIA standard FOTP-11, Test condition I. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.

5. Water Immersion Test. The closure shall be capable of preventing a 10-ft (3‑meter) waterhead from intruding into the splice compartment for a period of 7 days. Testing of splice closure is to be accomplished by the placing the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel and maintain a hydrostatic head equivalent to 10 ft (3 m) on the closure and cable. This process shall be continued for 7 days. Remove the closure and open to check for the presence of water. Any intrusion of water into the compartment containing the splices constitutes a failure.

6. Certification. It is the responsibility of the Contractor to insure that all of the above tests have been performed by either the manufacturer, or an independent testing laboratory, and the appropriate documentation has been submitted to the Engineer. Manufacturer certification is necessary for the model of closure supplied. It is not necessary to subject each supplied closure to the actual tests described herein.

**662-3.12 WARRANTY AND MAINTENANCE.** Manufacturer’s support (customary warranties) period shall be provided for all equipment and materials furnished and installed as part of the fiber-optic system. This includes end equipment such as modems, panels, switches and etc. Manufacturer’s and Contractor’s warranties or guarantees shall be continuous throughout their intended duration and be stated that they are subject to transfer.

**662-4.01 METHOD OF MEASUREMENT.** The Engineer will measure all work required to install a complete signal interconnect system as lump sum.

**662-5.01 BASIS OF PAYMENT.** The contract lump sum price for 662(3) pay item(s) shall be full compensation for furnishing all work and materials required to complete the work specified. Terminal blocks for the interconnect cable shall be paid under item 660(1), Traffic Signal System Complete.

When copper interconnect item is not included All work associated with supplying and installing copper interconnect materials is subsidiary to 662(3) pay item.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

662(3) Signal Interconnect, Fiber Lump Sum

Z524610000

SECTION 670  
TRAFFIC MARKINGS

Special Provisions

**670-1.01 DESCRIPTION.** Add the following:

Furnish, locate and install Pavement Markings as shown on the Plans and as directed.

Pavement Marking Type: Methyl Methacrylate (MMA)

**670-2.01 MATERIALS.** Replace the material reference,

“Methyl Methacrylate Markings Subsection 712-2.17”, with,

Methyl Methacrylate Pavement Markings Subsection 712-2.17

Add the following:

Methyl Methacrylate Pavement Markings are a combination of methyl methacrylate, glass beads and anti-skid aggregate.

Replace the last sentence with the following:

Submit a single certification from the manufacturer of the marking material, for each material combination, certifying the combination of marking material, glass beads and anti-skid aggregate, as furnished, provides the durability, retroreflectivity, and skid resistance specified.

**670-3.01 CONSTRUCTION REQUIREMENTS.** Replace No. 4 with the following:

4. Methyl Methacrylate Pavement Markings (MMA).

a. General. 15 days before starting work meet with the Engineer for a prestriping meeting. At this meeting, do the following:

(1) Furnish a striping schedule showing areas and timing of work, placing materials and the Traffic Control Plans to be used.

(2) Discuss placement of materials, potential problems.

(3) Discuss work plan at off ramps, on ramps and intersections.

(4) Discuss material handling procedures.

(5) Provide copies of the manufacturer’s installation instructions and copies of the Material Safety Data Sheets.

b. Manufacturer’s Representative. Provide the services of a manufacturer’s representative (the “Manufacturer’s Representative”). Ensure the Manufacturer’s Representative observes the application of the pavement marking materials. Cooperate with the Manufacturer’s Representative and the Engineer to ensure that the materials are placed according to these Specifications and the manufacturer’s recommended procedures.

c. Manufacturer Certified Installers. Install pavement markings using only striping installers certified by the marking materials manufacturer for the specific striping material and method. Submit these certifications to the Engineer at the Preconstruction Conference.

d. Preparation. Prepare the roadway surface to receive pavement markings according to these Specifications and the manufacturer’s recommendations. Clean and dry the roadway surface. Completely remove contaminants such as dirt, loose asphalt, curing agents, surface oils, or existing road marking materials before applying pavement marking material.

e. Equipment.

(1) Grooving Equipment.

Use grooving equipment that produces a dry cut. Use vacuum shrouded equipment or other equally effective containment procedures.

(2) Marking Equipment.

(a) Longitudinal Marking: Use truck mounted application equipment capable of installing a double centerline and a single shoulder line in a single pass. Use automatic bead applicators that place a uniform layer of beads on the lines. Hand units are not permitted.

(b) Other Markings: Use manual or automatic application equipment. Use stencils or extruders to form sharply defined markings.

f. Application. Apply marking material according to these Specifications and the manufacturer’s recommendations. Use equipment designed and capable of properly mixing at the place and time of application and approved by the manufacturer for the type of product being installed.

Anti-skid Aggregate. During marking material application, anti-skid aggregate will be evenly distributed and visible throughout the top 20 mils of the marking material mixture, and after the application, in the surface of the cured material.

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 N/A 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 N/A mils.

(b) Gore Markings:

Apply diagonal gore markings to yield a thickness of N/A 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 N/A mils. Apply markings to yield a thickness of N/A mils.

(c) Gore Markings:

Diagonal gore markings will not be inlaid unless shown in the Plans.

g. Disposal of Waste. Waste material(s) are the Contractor’s property. This includes grindings and removed marking material. Do not dispose of or store waste material(s) on State property. Dispose of waste material(s) according to applicable Federal, State, and local regulations.

h. Sampling. On the form provided by the Engineer, record the following readings and locations where they were taken using project stationing, and submit them to the Engineer with 24 hours for evaluation. Thickness of material and depth of slot are measured from the surface of the pavement.

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.

Add the following:

Refer to the Survey Field Books identifying the no passing zones (see Subsection 642-3.01)

**670-3.04 PAVEMENT MARKING REMOVAL.** Add the following:

Coordinate removal work with construction activity. Remove pavement markings the same day permanent markings are applied, unless otherwise directed. Use vacuum shrouded equipment or other equally effective containment procedures.

Replace Subsection 670-3.06 with the following:

**670-3.06 TOLERANCE FOR LANE STRIPING.**

1. Length of Stripe. ± 2 inches.

2. Width of Stripe. ± 1/8 inch.

3. Lane Width. ± 4 inches from the width shown on the Plans.

4. Stripes on Tangent. Do not vary more than 1 inch laterally within a distance of 100 feet when using the edge of the stripe as a reference.

5. Stripes on Curves. Uniform in alignment with no apparent deviations from the true curvature.

6. All Stripes. Keep the center of the stripe within planned alignment.

7. Double Stripes. ± 1/4 inch.

8. Thickness of Surface Applied. Minimum specified to a maximum of + 30 mils.

9. Depth of Inlay Slot. Minimum specified to a maximum of + 40 mils.

10. Thickness of Inlaid Marking Material. Fill inlay area completely from the bottom of the inlay to the surface of the pavement.

If it is determined that the material is being placed too thin, the beads are not properly placed, the anti-skid aggregate is not visible, or otherwise not to specification, make immediate adjustments to correct the problem.

Pavement markings applied by any method will be unacceptable if:

1. Marking is not straight or wide enough.

2. Thickness of line is not uniform.

3. Thickness of line is less than specified.

4. Material is uncured.

5. Material blackens or is inconsistent in color.

6. Inlay slot is not the specified depth.

7. Inlay slot is not filled to the specified depth.

8. Edge of the markings is not clear cut and free of overspray.

9. Reflective elements are not properly embedded.

10. Retroreflectivity of the markings is less than specified.

11. Anti-skid aggregate is not visible in the marking material during application and the dried surface.

12. Markings exhibit poor adhesion.

13. Color is not as specified.

Perform repairs using equipment similar to the equipment initially used to place the materials. Do not perform repairs in a “patch work” manner. If more than one repair is required in a single 500 foot section, grind and repair the entire section.

**670-4.01 METHOD OF MEASUREMENT.** Add the following:

Thickness will be measured from the top of the marking to the top of the pavement surface. Marking material placed in a depression left by pavement line removal will not be included in measuring the thickness of the line.

Delete No. 2.

Replace No. 3 with the following:

3. Each. Pavement markings using letters, numbers, and arrows will be measured on a unit basis with each separate word or symbol constituting a unit. Railroad Markings will be measured by the complete unit shown for each lane of travel.

Add the following No. 4:

4. Foot Basis. Longitudinal pavement markings, transverse, and gore markings, surface applied or inlaid will be measured by the linear foot of 4 inch wide line. Wider striping will be measured in multiples of 4 inches.

**670-5.01 BASIS OF PAYMENT.** Add the following:

For all phases of construction: There will be no separate payment for:

• Over-runs of material caused by the variation of the gradation of the asphalt

• Additional material required to achieve the thickness specified on open graded pavement

All work and materials associated with pavement markings are subsidiary to 670 items, including but not limited to:

• Milling for installation of the inlaid pavement markings including the removal of millings

• Temporary pavement markings and removal of conflicting markings, including repair of the roadway surface, milled surface or otherwise

• Traffic Control required for the installation of permanent and temporary pavement markings, removal of conflicting markings, and repairs

Replace Item 670(10) with the following:

Payment will be made under:

Pay Item No. Pay Item Pay Unit

670(10) MMA Pavement Markings Lump Sum

670(10A) MMA Pavement Markings, Longitudinal Surface Applied Linear Foot

670(10B) MMA Pavement Markings, Symbols and Arrow(s) Surface Applied Each

670(10C) MMA Pavement Markings, Transverse and Gore Surface Applied Linear Foot

670(10D) MMA Pavement Markings, Longitudinal Inlaid Linear Foot

670(10E) MMA Pavement Markings, Symbols and Arrow(s) Inlaid Each

670(10F) MMA Pavement Markings, Transverse and Gore Inlaid Linear Foot

CR670.1-110812R

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(1) 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 No. Pay Item Pay Unit

682(1) Vac-Truck Pothole Contingent Sum

CR682-010114

Special Provision

Add the following Section:

SECTION 683  
MISCELLANEOUS UTILITY WORK

**683-1.01 DESCRIPTION.** Construct or reconstruct appurtenances, electrical systems, mechanical systems, seals, and structural modifications for an existing utility Pressure Regulating Vault (PRV) owned by the City of Homer (COH), as shown in the plans.

**683-3.01. GENERAL.** Excavate, bed, and backfill according to the requirements of Subsections 204-2.01 and 204-3.01, and the Plans.

Seal all external joints as shown on the plans with pre-molded flexible watertight gasket and encapsulation seals. Gasket and encapsulation seals shall be Canusa-CPS WrapidSeal (18” wide), VISCOTAQ Viscowrap (12”wide), or approved equal.

**683-4.01 METHOD OF MEASUREMENT.** Section 109

**683-5.01 basis of payment.**

Pressure Regulating Vault (PRV). Modified in place with all hardware, appurtenances, bollards, electrical, mechanical, seals, and structural components as shown on the plans or as directed by the Engineer. PRV modifications will be paid for under Pay Item 683(4).

Excavation, bedding, and backfill is subsidiary to Pay Item 683(4).

Pay Item No. Pay Item Pay Unit

683(4) Utility Vault Structural & Electrical Modifications Lump Sum

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DIVISION 700 — MATERIALS

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SECTION 702  
ASPHALT MATERIALS

Special Provision

**702-2.01 ASPHALT BINDER.** Replace the 1st paragraph with the following:

Meet AASHTO M 320 Performance-Graded Asphalt Binder and AASHTO M332 Performance-Graded Asphalt Binder Using MSCR Test Specification; except, as included in Table 702-2.01-1 Performance-Graded Asphalt Binder – Exceptions.

**TABLE 702-2.01-1**

**PERFORMANCE-GRADED ASPHALT BINDER - EXCEPTIONS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Performance  Grade | Viscosity  AASHTO  T 316 | Multiple Stress Creep Recovery  MSCR,  AASHTO T 350 | | | Dynamic Shear PAV,  AASHTO T 315 | Direct Tension AASHTO  T 314 | Elastic Recovery AASHTO  T 301 |
| JNR3.2 kPa-1 | JNR Diff | % Recovery3.2 | G\*Sinδ, kPa |
| AASHTO M320 Performance-Graded Asphalt Binder | | | | | | | |
| PG 52-28 | None | — | — | — | None | Delete | None |
| PG 52-40 | None | — | — | — | None | Delete | None |
| PG 52-40 ER | None | — | — | — | None | Delete | 50% min. |
| PG 58-34 ER | None | — | — | — | None | Delete | 60% min. |
| PG 64-40 ER | None | — | — | — | None | Delete | 60% min. |
| AASHTO M332 Performance-Graded Asphalt Binder Using MSCR Test Specification | | | | | | | |
| PG52-40 V | None | 0.50 max. | Delete | 75 min. | None | Delete | None |
| PG58-34 E | None | 0.25 max. | Delete | 85 min. | None | Delete | None |
| PG 64-40 E | 1 Pa•s max. | 0.10 max. | Delete | 95 min. | 5000 max. @ 4°C | Delete | None |

CR702.3-100118R

**702-2.03 EMULSIFIED ASPHALT.**

2. Special Tack Emulsion, STE-1.

TESTS ON RESIDUE

Replace the first line: Penetration @ 77 °F 100-200,

with: Penetration @ 77 °F 100-250

CR702.2-060115R1

SECTION 703  
AGGREGATES

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 |
| **Degradation Value, min.** | ATM 313 | 30 | 30 | 30 | 30 |
| **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 |

**703-2.07 SELECTED MATERIAL.**

Replace 1. Type A with the following:

1. Type A. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by ATM 204 and ATM 205. Meet the following gradation as tested by ATM 304:

Sieve Percent Passing by Weight

No. 4 20-55%

No. 200 0-6%, determined on the minus 3-inch portion of the sample

**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.

CR703.1-100117R

SECTION 705  
JOINT MATERIAL

Special Provisions

Replace Subsection 705-2.05 with the following:

**705-2.05 FLEXIBLE WATERTIGHT GASKETS.** Ring gaskets (seals):

1. Joining rigid concrete (cast-in-place and precast) pipes, manholes, box sections and other structures:

a. ASTM C443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

b. ASTM C990 Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed flexible Joint Sealants (Butyl Rubber Sealant)

c. ASTM C1628 Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets

d. ASTM C1619 Specification for Elastomeric Seals for Joining Concrete Structures

Class B (oil resistant performance)

2. Joining flexible metal pipe (steel and aluminum):

a. ASTM C443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

b. ASTM C1619 Specification for Elastomeric Seals for Joining Concrete Structures

Class B (oil resistant performance)

c. ASTM D1056 Specification for Flexible Cellular Materials-Sponge or Expanded Rubber

(1) Type 2-Closed cell rubber

(2) Class B-Oil resistance with low mass change

(3) Grade 3-Compression-deflection range from 9 to 13 psi

Use continuous flat gaskets with thickness 1/2-inch greater than the nominal depth of the corrugation for bands with projections or flat bands and 3/8-inch for corrugated bands.

3. Joining plastic pipe:

a. ASTM D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

b. ASTM F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

Not less than 50% by volume oil resistant polymer

CR705.1-010119

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.

CR706.1-050119

Replace Subsection 706-2.08 with the following:

**706-2.08 HDPE PIPE FOR WATER AND SANITARY SEWER SYSTEMS.** Use high density polyethylene (HDPE) pipe and fittings manufactured from PE 3408 resin that meets ASTM D3350 with a cell classification of 345464C. Ensure the entire system is made of materials with a 150 psi rated working pressure, except material two inch or less in diameter shall have a 200 psi rate working pressure. Join all pipe and fittings by either butt fusion of flanges as per manufacturer’s recommendation. No mechanical joints are allowed. Meet the following:

HDPE Pipe 2” or Less ASTM D2737

HDPE Pipe over 2” ASTM F714

Butt Fusion Fittings ASTM D3261

Flanged Joints ASTM D3261

When HDPE Arctic Pipe is called for, the insulated pipe shall meet the above requirements, be surrounded by a 3” minimum polyurethane insulation coat, and encased by an HDPE pipe outer jacket with a 175 mil minimum thickness.

3” Polyurethane Insulation ASTM C1029

HDPE Jacket ASTM F714

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SECTION 707  
METAL PIPE

Special Provisions

Replace Subsection 707-2.05 with the following:

**707-2.05 DUCTILE IRON PIPE FOR WATER AND SANITARY SEWER.** Use ductile iron pipe and fittings that are bituminous coated, cement mortar lined, have push on type joints, and 150 psi working pressure. Meet the following:

Cement Mortar Lining ANSI/AWWA C104

Loose Polyethylene Encasement ANSI/AWWA C105 (8 mil when required)

Ductile Iron Fittings ANSI/AWWA C110 or C153, and C104

SBR Rubber Gaskets ANSI/AWWA C111 (Push on or mechanical joint)

Threaded Flange Joints ANSI/AWWA C115

Ductile Iron Pipe ANSI/AWWA C150 and C151 and C104

When Arctic Pipe is called for, the insulated pipe shall meet the above requirements, be surrounded by a 3” minimum polyurethane insulation coat, and encased by an HDPE pipe outer jacket with a 175 mil minimum thickness.

3” Polyurethane Insulation ASTM C1029

HDPE Jacket ASTM F714

Add the following Subsection 707-2.08:

**707-2.05 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.

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SECTION 712  
MISCELLANEOUS

Special Provisions

**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:

I. Color: Yellow, PR-1 Chart, 33538 Federal Yellow. White, minimum daylight reflectance of 84.

**712-2.18 GLASS BEADS FOR METHYL METHACRYLATE PAVEMENT MARKINGS.** Replace the bead table with the following:

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.

CR712.1-010109R

SECTION 726  
TOPSOIL

Special Provision

Replace Subsection 726-2.01 with the following:

**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 |

CR726.1-010120

Special Provisions

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 stabilization materials.

**727-2.01 MULCH.** Flexible blanket/covering, temporary degradable (bio/photo) form of erosion control. Use one of the following:

**Dry Erosion Control, Stabilization Products.** Hand applied or spread with mulch blower equipment.

1. Straw. Use straw, in an air-dried condition, from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, seeds, mold, or other materials detrimental to plant life. Straw material shall be certified weed-free straw using North American Weed Management Association (NAWMA) Standards. In-lieu of certified weed-free straw provide documentation that the material is steam or heat treated to kill seeds or provide U.S. or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.

2. Shredded Bark Mulch. Shredded bark and wood with the following characteristics:

a. Not containing resin, tannin, or other compounds in quantities harmful to plant life.

b. Maximum length of individual pieces is 2 inches with 75% passing through a 1 inch sieve.

c. Will form a uniform ground cover/mat, have moisture absorption, retention, and percolation properties, not be susceptible to spreading by wind or rain providing a good growth medium.

d. May contain up to 50% shredded wood material.

e. Shredded wood material aged 1 year minimum prior to use.

**Hydraulic Erosion Control Products (HECPs)** Applied hydraulically.

A fiber mulch matrix: biodegradable and composed of wood, straw, coconut and other fibers natural and man-made. When applied, create a continuous, porous, absorbent high water holding, flexible blanket/mat/mulch/covering making intimate contact with, and adhering to sloped soil surface; permitting water infiltration; resists erosion and promotes rapid germination and accelerated plant growth. The fibers may be thermally processed, and cross-linked with a hydro-colloidal or linear anionic tackifier (curing period 24-48 hours) or mechanically-bonded (no curing period). When agitated in slurry tanks with water the fibers will become uniformly suspended, without clumping to form homogeneous slurry.

The HECPs shall be delivered premixed by the manufacturer. The HECP will contain only the materials provided in the sealed containers from the manufacturer. No added components are permitted after the manufacturer seals the product container, before application, during application or otherwise. Submit documentation dated within 3 years of application, from an independent accredited laboratory as approved by the Engineer, showing that the product's testing performance meets the requirements for the slope(s) to be protected on the project, according to the National Transportation Product Evaluation Program (NTPEP), Erosion Control Technology Council (ECTC) and or the Texas DOT/Texas Transportation Institute (TTI) Laboratory.

If the HECP contains cotton or straw provide documentation that the material is certified weed free using NAWMA Standards. In-lieu of certified weed-free straw, provide documentation that the material is steam or heat treated to kill seeds or provide U.S. or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.

The HECP shall contain a dye to facilitate placement and inspection of the material.

1. Wood Strand, Fiber.

A blend of angular, loose, long thin wood pieces with a high length to width ratio and that are frayed. Minimum 95% of strands between 2 inches and 10 inches, at least 50% of the length shall have a width thickness between 1/16 and 1/8 inch. No single strand shall have a width or thickness greater than 1/2 inch. Processed wood fiber with the following characteristics:

a. Will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer and other additives to form homogeneous slurry.

b. Will form a blotter-like uniform ground cover on application, have moisture absorption, retention and percolation properties, the ability to cover, and hold grass seed in contact with soil, and not create a hard crust upon drying providing a good growth medium.

2. Dried Peat Moss. Partially decomposed fibrous or cellular stems and leaves of any of several species of Sphagnum mosses with the following characteristics:

a. Chopped or shredded to allow distribution through normal hydraulic type seeding equipment and capable of being suspended in water to form part of a homogeneous slurry.

b. Free from woody substances and mineral matter such as sulfur or iron and with a pH value of between 4.0 and 6.5.

c. Furnished in an air dry condition and containing less than 35% moisture by weight. Have a water holding capacity of not less than 800% by weight on an oven dry basis.

3. Fiber Matrix (FM) Mulch - Types.

a. Stabilized Mulch Matrices (SMMs)

b. Bonded Fiber Matrices (BFMs)

c. Mechanical Bonded Fiber Matrix (MBFM)

d. Polymer Stabilized Fiber Matrix (PSFM)

e. Fiber Reinforced Matrices (FRMs)

• Flexible Growth Medium (FGM)

• Extended-Term Flexible Growth Medium (ET-FGM)

**727-2.02 MATTING.** Fiber mulches, mulch matrices, nets and turf reinforcement mats manufactured from wood fibers, straw, jute, coir, polyolefins, PVC, nylon and others creating dimensionally stable nets, meshes, geotextiles and blankets; creating a continuous, porous, absorbent, flexible blanket/mat/mulch/covering making intimate contact with and adhering to sloped soil surface, resisting erosion and promoting rapid germination and accelerated plant growth.

**Rolled Erosion Control Products (RECPs)** (Temporary Degradable and Permanent Erosion Control)

Use RECPs that bear the Quality and Date Oversight and Review (QDOR) Seal from the ECTC. Independent test results from the NTPEP, that the mulch, when tested according to ASTM 6459 Standard Test Method for Determination of Rolled Erosion Control Products (RECP), Performance in Protecting Hillslopes from Rainfall-Induced Erosion, meets the performance requirement using the Revised Universal Soil Loss Equation (RUSL).

Functional Longevity.

1. Temporary Degradable.

a. Duration.

1) Short-Term RECPs. (RECPs 3 - 12 months)

C Factor = .15 maximum

Test Soil Type = Sandy Loam

(National Resources Conservation Service (NCRS) Soil Texture Triangle)

2) Moderate (Extended) -Term RECPs. (RECPs 24 months)

C Factor = .05 maximum

Test Soil Type = Sandy Loam (NCRS Soil Texture Triangle)

3) Long-Term RECPs. (RECPs 36 months)

C Factor = .01 maximum

Test Soil Type = Sandy Loam (NCRS Soil Texture Triangle)

b. Product types.

1) Mulch-Control Nets (MCNs). Planar woven natural fiber or extruded geosynthetic mesh used to anchor loose fiber matting/mulches.

2) Erosion Control Blankets (ECBs). Processed natural and/or polymer fibers, yarns or twines mechanically, structurally, or chemically bound together to form a continuous matrix with a minimum weight of 8 oz/yd2 and a limiting shear stress of 0.45 lb/ft2.

3) Netless. Fibers mechanically interlocked and/or chemically adhered together.

4) Single-net and Double-net. Fibers mechanically bound together by single or double netting.

5) Open Weave Textiles (OWTs). Fibers woven into a continuous matrix.

c. Materials.

1) Burlap. Standard weave with a weight of 3.5 to 10 oz/yd2.

2) Jute Mesh Fabric. Cloth of a uniform, open, plain weave of undyed and unbleached single jute yarn. Use yarn that is loosely twisted and not varying in thickness more than one-half its normal diameter. Furnish jute mesh in rolled strips meeting the following requirements:

a) Width: 45 to 48 inches, ± 1 inch

b) 78 warp-ends per width of cloth (minimum)

c) 41 weft-ends per yard (minimum)

d) Weight: 20 ounces per linear yard, ± 5%

3) Woven Paper or Sisal Mesh Netting. Woven from twisted yarns available in rolls 45 to 48 inches wide. Mesh may vary from closed to open weave, ranging from 1/8 to 1/4 inch openings. Shrinkage after wetting may not exceed 20% of the surface area.

4) Knitted Straw Mat. Commercially manufactured ECB. Use photodegradable netting and biodegradable thread. Use straw, in an air-dried condition, from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, seeds, mold, or other materials detrimental to plant life. ECB may contain coconut or fiber to reinforce the straw. Straw material shall be certified weed-free straw using NAWMA Standards. In-lieu of certified weed-free straw, provide documentation that the material is steam or heat treated to kill seeds or provide U.S. or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.

5) Woven/Curled Wood blanket. Machine produced mat of curled wood shavings with a minimum of 80% 6-inch or longer fibers, with consistent thickness and the fibers evenly distributed over the entire area of the blanket. Smolder resistant without the use of chemical additives. Cover the top side of the blanket with biodegradable extruded plastic mesh.

6) Coconut (Coir Fiber). Machine produced mat, ECB of consistent thickness and coir fiber evenly distributed over the area of the mat. Use bio/photo degradable netting and thread.

2. Permanent.

a. Product Types and Materials.

1) Turf Reinforcement Mats (TRMs). A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness with a minimum weight of 8 oz/yd2 and a minimum limiting shear stress of 1.5 lb/ft2. TRMs (may be supplemented with degradable components) shall impart immediate erosion protection, enhance vegetation establishment during and after maturation and permanent vegetation reinforcement providing long-term functionality.

**727-2.03 SEDIMENT RETENTION FIBER ROLLS (SRFRs).** Fiber rolls also referred to as wattles. Manufacture of photodegradable or biodegradable fabric netting without preservative treatment, evenly woven, free of crusted material, cuts, and tears. Manufacture stakes of photodegradable or biodegradable material (wood stakes, except as approved by the Engineer).

1. Filter Sock (Wattle)

a. Fabric netting.

b. Filled with wood fiber, straw, flax, rice, coconut fiber material.

c. Minimum diameter 5 inches.

2. Compost Sock.

a. Extra Heavy weight fabric netting with a minimum strand width of 5 mils.

b. Filled with coarse compost.

c. Minimum diameter 8 inches.

3. Coir Log.

a. Woven wrap bristle coir twine netting.

b. Filled with 100% coconut (coir) fiber uniformly compacted.

c. Segments maximum length 20 foot, diameter as suited to the application and a density of 7 lbs/pcf or greater.

d. Coir twine strength equal to 80 lb minimum weaved to a 2 inch x 2 inch opening pattern.

e. Ties made of hemp rope by 1/4 inch diameter.

**727-2.04 COMPOST.** Suitable for serving as a soil amendment or an erosion control material. Sanitized, mature compost meeting local, state, and Federal quality requirements tested and certified by the U.S. Composting Council (USCC) under the Seal of Testing Assurance (STA) Program. Biosolids compost must meet the Standards for Class A biosolids outlined in 40 Code of Federal Regulations (CFR) Part 503. Additionally, meet the requirements of the AASHTO specifications:

1. Compost Blankets. Standard Practice for Compost for Erosion/Sediment Control (Compost Blankets) R 52.

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.

CR727-050812R

Special Provision

Replace Section 729 with the following:

SECTION 729  
GEOSYNTHETICS

**729-2.01 GEOTEXTILE FOR SUBSURFACE DRAINAGE, SEPARATION, STABILIZATION, EROSION CONTROL AND EMBANKMENT REINFORCEMENT.**

1. Subsurface Drainage. Meet AASHTO M 288 for Subsurface Drainage, except provide a minimum permittivity of 0.5 sec-1, and meet Class 2 Strength Property Requirements.

2. Separation. Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec-1, and meet Class 3 Strength Property Requirements.

3. Stabilization. Meet AASHTO M 288 for Stabilization, except provide a minimum permittivity of 0.50 sec-1, and meet Class 1 Strength Property Requirements.

4. Erosion Control. Meets AASHTO M 288 for Permanent Erosion Control and meet Class 1 Strength Property Requirements.

5. Reinforcement. Meet the requirements in Table 729-1 for Type 1 or Type 2.

Package, label, handle and store geotextile materials according to ASTM D 4873.

**TABLE 729-1**

**GEOTEXTILE REINFORCEMENT PROPERTIES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Property** | **Test Method** | **Units** | **Requirement a** | |
| **Type 1** | **Type 2** |
| Grab Tensile | ASTM D 4632 | lb. | 200/200 | 400/400 |
| Grab Elongation | ASTM D 4632 | % (MD) | 10 | 10 |
| Wide Width Tensile | ASTM D 4595 | lb./in. (ultimate) | 200/200 | 400/400 |
| Wide Width Tensile | ASTM D 4595 | lb./in. (@ 5% strain) | 100/100 | 200/200 |
| Seam Breaking Strength | ASTM D 4632 | lb./in. | 180 | 360 |
| Puncture | ASTM D 6241 | lb. | 500 | 1500 |
| Trapezoidal Tear | ASTM D 4533 | lb. | 100 | 150 |
| AOS | ASTM D 4751 | U.S. sieve size | #30 b | #30 b |
| Permittivity | ASTM D 4491 | sec-1 | 0.20 | 0.20 |
| Flow Rate | ASTM D 4491 | gal./min./ft2 | 10 | 10 |

a. Minimum Average Roll Values (MARV) in machine-direction (MD) and cross-machine direction (XD) unless otherwise specified.

b. Maximum average roll value

**729-2.02 RESERVED.**

**729-2.03 PAVING FABRIC.** Meet AASHTO M 288 for Paving Fabric.

**729-2.04 SILT FENCE.** Meet AASHTO M 288 for Temporary Silt Fence.

**729-2.05 GEOGRID FOR EMBANKMENT AND ROADWAY STABILIZATION AND REINFORCEMENT.** Provide geogrid consisting of a regular network of connected polymer tensile elements with aperture geometry sufficient to provide significant mechanical interlock with the surrounding material. Provide dimensionally stable geogrid that is able to retain its geometry during construction. Provide geogrid structure that resists ultraviolet degradation and all forms of chemical and biological degradation encountered in the material in which it is buried.

Package, label, handle, and store geogrid material according to ASTM D 4873.

1. Stabilization. Provide geogrid that meets the survivability requirements in Table 729-2 and meets the physical requirements in Table 729-3.

2. Reinforcement. Provide geogrid that meets the survivability requirements in Table 729-2.

**TABLE 729-2**

**GEOGRID SURVIVABILITY REQUIREMENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Property** | **Test Method** | **Units** | **Requirement** | |
| **Class 1** | **Class 2** |
| Ultimate Multi –Rib Tensile Strength a | ASTM D 6637 | lb./ft. | 1230 | 820 |
| Junction Strength a | ASTM D 7737 | lb. | 25 | 25 |
| Ultraviolet Stability (Retained Strength) | ASTM D 4355 | % | 50% after 500 hours of exposure | |

a. Minimum Average Roll Values (MARV) in any rib direction.

**TABLE 729-3**

**Geogrid Physical Requirements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Property** | **Test Method** | **Units** | **Requirement** |
| 2% Tensile Strength a | ASTM D 6637 | lb./ft. | ≥ 400 |
| 5% Tensile Strength a | ASTM D 6637 | lb./ft. | ≥ 800 |
| Percent Open Area | COE, CW-02215 | % | 50 – 80 |
| Aperture Size b | Direct measure | in. | 0.5 – 3.0 |

a. Minimum Average Roll Values (MARV) in machine-direction (MD) and cross-machine direction (XD).

b. Measured as the spacing between parallel ribs.

CR729-050117

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.

CR730.1-062204

Replace Subsection 730-2.05 with the following:

**730-2.05 FLEXIBLE DELINEATOR POSTS.** Durable fiberglass composite, polymer, or plastic material meeting the dimensions and colors shown on the Plans. Resistant to ultraviolet light, ozone and hydrocarbon damage and remain flexible at a temperature of minus 40 °F. Provide posts with reflectors that are capable of self-erecting and remaining serviceable after 5 head-on impacts at 55 mph and 10 impacts at 35 mph with an automobile at an air temperature of plus 40 °F.

Terminal Markers - Flexible (marker). The marker includes the pole/post/rod (pole), reflective and retroreflective sheeting and mounting hardware.

Provide durable markers: resistant to impact from (snow and vehicle), vandals, ultraviolet light, moisture, ozone, and hydrocarbons.

When the pole is loaded, the marker shall bend/flex, remain flexible and oriented as installed continuing to function as designed without permanent displacement along the length of the member. Provide the flexibility in the primary vertical element, a connecting device between the vertical element and connection to the support member (spring or other) or a combination.

Provide a connection sufficient to transfer the loads from the pole to the supporting member without reducing the strength, flexibility, or durability of either. The connection shall not negatively influence the performance of the guardrail. Provide approval of the connection from the marker manufacturer and support member manufacturer (if proprietary).

• Design Loads:

⮚ Impact load from snow thrown by snowplows

⮚ Weight of snow covering the pole (snow thrown from snowplows)

⮚ Wind loads (100 mph, 3 sec gust)

• Service Temperature Range: -40˚ F to +140˚ F.

• Pole:

1. Material:

⮚ Steel, or

⮚ Stainless Steel, or

⮚ Other Poles:

(a) Continuous glass fiber and marble reinforced thermosetting composite, or

(b) Engineered plastic alloy, or

(c) Fiberglass Reinforced Polyester (FRP)

(d) High-Impact Polyolefins

2. Dimensions

⮚ Top of Pole: 60 inches to 84 inches above top of guardrail

⮚ Width/Diameter: minimum = 1 1/4 inches, maximum = 2 inches (steel/stainless steel not be greater than 5/8 inch diameter)

⮚ Thickness: as required by design

3. Visibility:

⮚ Daytime: Pole - color orange

a. Steel and Stainless Steel Poles: Applied permanent finish.

b. Other Poles: Color pigment ultraviolet stabilized and solid through the cross section from end to end.

⮚ Nighttime: Added retroreflective sheeting - color white

a. Approximately 12 square inches visible from the traveled way before and after the marker. Applied to a flag attached to the pole or as banding applied directly to the pole. (A flag is required when using steel/stainless steel poles.)

b. Place top edge of flag/banding 1 inch from top of pole.

(1) Flag: Single retroreflective sheet each face

(2) Banding: Two bands completely around marker, 4 inches between bands

• Hardware and Fasteners:

⮚ Steel, and/or

⮚ Stainless Steel, or

⮚ Aluminum alloy (hardware only)

Manufacturers of flexible markers (snowpoles):

|  |  |  |  |
| --- | --- | --- | --- |
| **Manufacturer** | **Model** | **Type** | **Contact** |
| Nordic Fiberglass, Inc. | FF2 | Steel Pole w/ Flag | Ph: (218) 745-5095 |
| PEXCO | Model 3639 | High-Impact Polyolefins | Ph: (404) 564-8560 |
| New Century Northwest, LLC | NCN2549 | Engineered Plastic Alloy | Ph: (541) 485-5566 |
| Carsonite Composites, LLC | SNFB | Continuous glass fiber and marble reinforced thermosetting composite | Ph: (800) 648-7916 |

Submit manufacturer's specifications to the Engineer for review and approval before ordering terminal markers.

CR730.2-122217

Special Provision

Replace Section 740 with:

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, ETL, 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 POLES.**

1. Design. Design and fabricate low mount electroliers to conform to the 1994 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with interim revisions and the highway lighting sheets in the plans. Use a wind speed of 100 mph with a gust factor of 1.3. Design each electrolier to support a sign with an area of 16 square feet with its centroid located 14 ft. above the pole base.

Design and fabricate traffic signal structures to the 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 III, with, a vibration galloping computations, using a basic wind speed of 100 mph and Central Region standard loads.

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.

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.

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 gage (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 the 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.

3. Submit the mill certifications for the steel items (piles, plates, bolts, and other related items) to the Engineer for approval.

4. Welding. Perform welding to conform to Subsection 504-3.01.7, as shown on the plans, 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. 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.

4. Anchor Rods & Bolts. Furnish anchor rods and bolts as shown on plans. When ASTM F1554 is specified, conform to Supplemental Requirements S2, S3, and S4.

5. Miscellaneous. Finish the edges of poles and mast arms to conform to the following requirements. Before hot dip galvanizing, neatly round the following features to the radius specified.

a. On holes through which electrical conductors pass, provide a 1/16 inch radius on both the entrance and exit edges,

b. On pole base plates, provide a 1/8 inch radius on edges along which plate thickness is measured and a smooth finish on all other exposed edges,

c. On the ends of tubes that form slip type joints, complete the following tasks on the two surfaces that contact one another. First, provide 1/16 inch radii on the inside and outside edges of the female and male segments, respectively. Then for the length of the joint plus one half the diameter of the female section grind down welds until they feature a radius concentric with the mating surface and remove material protruding from the two surfaces.

Provide caps to cover the free ends of poles and mast arms.

Identify critical information for poles and arms with visible permanent aluminum tags that contain the information shown in Table 740-1. The measurements shown are for illustration purposes only. Use tags large enough to include required information using 1/4 inch high text, 3/8 inch of space between successive lines of text, and at least 3/8 inch of space between the edges of the tag and the text. Secure the tags with two 1/8 inch blind rivets at the base of poles and the underside of mast arms. If furnishing a two piece signal mast arm with slip type joint, mark both pieces with the same message. Provide the holes for the blind rivets before galvanizing.

**TABLE 740-1**

**POLE MARKINGS**

*Note: Italic type indicates additional Tag Markings if poles have 2 luminaire or 2 signal mast arms.*

|  |  |  |
| --- | --- | --- |
| **POLES**  (Including Mast Arms ) | **MEASUREMENTS** | **TAG MARKINGS** |
| **Signal Poles** |  |  |
| Signal mast arm length | 45 ft./55 ft. | SMA 45/*SMA 55* |
| Luminaire mast arm length | 22 ft./18 ft. | LMA 22/*LMA 18* |
| Pole height | 36 ft. | PH 36 |
| Intersection number (if more than one) -pole number |  | 1 - P 4 |
| Sum of signal mast arm moments about centerline  of signal pole |  | SM 4000/*SM 3200* |
| Design wind speed | 100 mph | DWS 100 |
| **Light Poles** |  |  |
| Luminaire mast arm length | 15 ft./15 ft. | LMA 15*/LMA 15* |
| Pole height | 37 ft. | PH 37 |
| **Signal Mast Arm** |  |  |
| Mast arm length | 40 ft. | SMA 40 |
| Intersection number (if more than one) -pole number |  | 1 - P 4 |
| Sum of signal mast arm moments about centerline  of signal pole |  | SM 3740 |
| Design wind speed | 100 mph | DWS 100 |
| **Luminaire Mast Arm** |  |  |
| Mast arm length | 18 ft. | LMA 18 |
| Pole number (if unique arm design) |  | P 4 |

**740-2.03 WOOD POLES.** Use wood poles for service or temporary installations of the class shown on the Plans or as specified in the Special Provisions.

Use 45-foot poles, except for service poles use 25-foot poles.

Use mastarms and tie rods for wood pole installations that conform to Subsection 740-2.02, and to the details shown on the Plans. Provide each mastarm with an insulated wire inlet and wood pole-mounting bracket for mastarm 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 Gage (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 gage 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.

1. 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.

1. 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 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.

1. 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.
2. 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.
3. 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.

1. 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 AND FITTINGS**. 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. Use fuses that are 10 ampere, midget (13/32” x 1-1/2“) ferrule type with a fast acting current limiting (KTK type) 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 NTCIP Requirements as defined in NTCIP1202. 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 Cobalt ATC Touch 2100

Use LED indicators for all electronic devices covered under Subsections 740-2.09 through 740-2.13.

**740-2.10 CONTROLLER UNIT**.

Actuated Controller Unit (CU).

Provide solid state, Type A2N Actuated Controller Units (CU) meeting the requirements of Section 3 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements.

1. The CU must meet the referenced National Transportation Communications for ITS Protocol (NTCIP) and comply with publication TS 3.2 the Simple Transportation Management Framework, and shall meet the requirements for Conformance Level 2
2. 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.
3. 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.
4. Provide controllers with display heaters or enhancements to improve viewing in temperatures below 0 °F.
5. 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, 32MB

**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 NTCIP Requirements (NEMA TS-2), Section 5 Terminals and Facilities and Section 7 Cabinets.

1. Standard Features. Supply the following standard features:
   1. Materials

Unless otherwise designated in the Plans, provide cabinets constructed of sheet Aluminum.

* 1. Cabinet Dimensions

Unless otherwise designated in the Plans, provide a size 7 cabinet as defined in NEMA TS-2 Table 7-1.

* 1. Doors
     1. Provide doors meeting the requirements of NEMA TS-2 Section 7.5. The lock must accept a Best CX series core that will be installed by the Department after the Contract is complete.
     2. Provide a Police Compartment meeting the requirements of NEMA TS-2 Section 7.5.7. The Police Compartment shall house the following switches:
        1. "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.
        2. "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.
     3. Permanently label switches in the Police Compartment.
  2. Shelves

Provide shelves meeting the requirements of NEMA TS-2 Section 7.6. 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.

* 1. Finish and Preparation

Unless otherwise designated in the Plans, provide unpainted Aluminum Cabinets with a "natural" brushed appearance.

* 1. 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.
  2. 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.
       1. 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 -2.1115 °F above the closing temperature. The adjustment must have an indicating pointer.
       2. 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 beneath the auxiliary "goose neck" cabinet light. The thermostat shall be mounted immediately to the left of the heating device on the cabinet door.
       3. 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.
  1. Auxiliary Cabinet Equipment
     1. Mount a hooded incandescent light fixture with a Type A base on a 15 inch flexible "goose neck" from the cabinet door. Use a fixture UL rated to accommodate a 2700 k LED lamp, 450 Lumen output with an integral "ON-OFF" rotary switch mounted on the lamp hood. Mount a LED strip lighting fixture on the inside of the cabinet near the top front edge and under the controller shelf. Use a fixture rated to accommodate 4000K LED operated from a high power factor UL or ETL listed ballast. The lamp must be included. 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 AK DOT’s current version of AutoCAD and deliver with paper set, along with a “.pdf” copy.
     3. Provide two (2) paper set of manuals for the controller, Malfunction Management Unit and vehicle detector amplifiers with each cabinet. Make said manuals available in electronic Adobe ".pdf" format and deliver with paper set.
  2. 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.
       1. Equip the cabinet with required control and auxiliary equipment connecting cables to operate the phases and detection indicated on the Plans, including future use.
       2. 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.
       3. 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.
  1. 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 two 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 two 32 position bus bars, for terminating the equipment grounding and neutral conductors from field wiring.
  1. 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
       1. Main circuit breaker must be a single pole, 20 ampere, 10,000 amperes interrupting capacity for each cabinet.
       2. 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.

* + 1. 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.
    2. 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.
       1. 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.
       2. 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.
       3. 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.
    3. 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.
       1. 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.
       2. 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.
       3. Connect the ground connection of the radio interference suppressor only to AC neutral. Do not connect to Earth Ground directly.
    4. 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.
    5. 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:
       1. "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.
       2. An electrical outlet. It must be a duplex, 3 prong, NEMA Type 5-20R grounding type outlet with independent ground fault circuit protection.
       3. "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.
       4. "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.
       5. "heater by-pass" switch to bypass the remote heater thermostat.
       6. 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.

1. 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 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.

**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 NTCIP Requirements (NEMA TS-2).

1. Inductive Loop Detector Units. Provide inductive loop detectors that conform to the requirements of NEMA TS-2, Section 6.5 Inductive Loop Detector Units. Unless otherwise called for in the Plans provide 2 Channel Inductive Loop Detectors with audible feedback of detection events. The audible feature must be manually switchable between audible "on" and silent "off."
2. Local Coordination Units. Provide actuated coordination that conforms to the requirements of NEMA TS-2, Section 3.6 Actuated Coordination.
3. System Modem/Interface Unit. Supply a system modem/interface unit assembly that is compatible with the existing computerized traffic control system.
4. Preemption Units. Provide preemption that conforms to the requirements of NEMA TS-2, Section 3.7 Preemption and the following:
   1. EVP Infrared Opticom

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.

* + 1. 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.
    2. Unless otherwise shown on the Plan use Opticom Traffic Control Systems Opticom Detector Model 721 preemption detectors.
    3. 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.
    4. 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.
    5. Install Model 138 detector lead in cable between the end of each signal mast arm and the controller cabinet. 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.
    6. The controller, rather than the phase selector or auxiliary logic, must perform interval timing, signal sequences, and phase skips.
    7. 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.
    8. When emitters are required, provide GTT Opticom Priority Control System, Model 794H Emitter with 793 in vehicle switch. 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 792R emitter on a magnetic base, 793R switch and cigarette lighter adapter power cord in a "Camera Bag" case.
  1. GPS Opticom Unit

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.

1. 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.
2. Unless otherwise shown on the Plan use Opticom Model 3100 GPS/Radio Unit containing a GPS receiver with Antenna and a 2.4 GHz spread transceiver with antenna.
3. Furnish a 11 conductor radio/GPS cable to connect the Traffic Control Systems 764 Phase Selectors to the Model 3100 GPS Radio Unit.
4. 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.
5. Mount GPS Unit 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.
6. When GPS emitters are included in the project, provide GTT Opticom Priority Control System, Model 792H Emitter with 793 in vehicle switch. 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 the Emitter Software Kit including required connection cables.
       4. One GTT Opticom Portable Emitter Kit with 794R emitter on a magnetic base, 2100 Control Unit and cigarette lighter adapter power cord in a "Camera Bag" case.
7. 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
   1. 10 years experience working in the traffic controller industry, 5 years of that must have been as a signal technician.
   2. Must have IMSA Traffic Signal Technician, Level II certification
   3. Experience assisting with the Northern Region ADOT, or the Central Region ADOT
   4. Familiarity with both the NEMA TS1 and TS2 specifications
   5. Competent to read cabinet wiring diagrams and troubleshoot cabinet components
   6. Competent to troubleshoot Preemption issues
   7. Competent to test and Install GPS Preemption components
   8. 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 ADOT personnel from any of its three regions. Required training includes:
   1. 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 ADOT traffic Engineers. Deliver training time, day and location mutually agreeable to the contractor and the Traffic Design or Operations Engineer.
   2. 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
   3. 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.
3. 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.
4. 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.
5. Radar Detection System.

a. System Hardware. For vehicle detection, provide a complete and functional Wavetronix digital wave radar vision system or Econolite AcccuScan forward-fire radar system including the following:

(1) Stop bar detector (SBD). For all approaches indicated in the plans, provide an above-ground stop bar detector (SBD). If utilizing a Wavetronix digital wave radar vision system, provide a Wavetronix SmartSensor Matrix®. Otherwise provide an AccuScan 600C or 1000C®.

(a) Testing. Each sensor shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each SBD according to the rules set forth by the FCC. The SBD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The SBD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.

(b) Support. The SBD manufacturer shall provide both training and technical support services.  
  
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.  
  
Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied SBD. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of SBDs should such services be required.

(c) Documentation. SBD 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 manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:

* + - * 1. FCC CFR 47 certification
        2. IEC 61000-4-5 class 4 test report
    1. Continuous tracking advance extended range detector (CTAD). For all intersection approaches indicated in the plans defined with high AADT, provide a CTAD. If Wavetronix digital wave radar vision system is used, provide a Wavetronix SmartSensor Advance Extended Range®. If utilizing an Econolite AcccuScan forward-fire radar for stop bar and advanced detection, no CTAD is needed.   
       1. Testing. Each CTAD shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each SBD according to the rules set forth by the FCC. The SBD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The SBD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.
       2. Support. The CTAD manufacturer shall provide both training and technical support services.

Training. The manufacturer-provided training shall be sufficient to fully train installers and operators in the installation, configuration, and use of the detector unit to ensure accurate CTAD performance.

Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied detector unit. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of the detector unit should such services be required.

* + - 1. Documentation. 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 manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:   
         1. FCC CFR 47 certification
         2. IEC 61000-4-5 class 4 test report
    1. Cabinet interface system. As shown in plans for permanent signals and for each temporary signal cabinet, provide the devices required by the radar system manufacturer to provide streamlined communication from radar sensors to traffic controllers. This system shall communicate directly to the controller through SDLC, and support contact closure devices as well. It shall also provide power, surge protection, and Ethernet connectivity for all sensors.  
       1. Mounting.
          1. Shelf-mount or DIN rail mount
       2. Connections and Communications.
          1. One RJ-45 10/100 Ethernet jack
          2. One SDLC port
          3. Four or six ports for connecting to sensors via RS-485
          4. USB connector
       3. Testing.
          1. Complies with the applicable standards stated in the NEMA TS2-2003 Standard
          2. FCC-compliant
          3. Passes manufacturers test before shipping
  1. Configuration software. Provide software from the radar system manufacturer to configure and monitor the radar sensors.
  2. Detector mount. Provide a mounting assembly from the radar sensor manufacturer for each sensor.
  3. Installation Kit. Provide an installation kit from the radar system manufacturer, for use while installing and configuring radar vehicle sensing devices or continuous tracking advance detectors and in-cabinet contact closure and communication connectivity devices.
  4. Econolite AccuScan forward-fire radar: For each sensor, provide a manufacturer recommended 4-pair communication cable of length to run without splicing from the radar sensor to the cabinet interface system inside the controller cabinet. Provide 15 feet of neatly coiled slack cable in the base of the base of the controller foundation. Provide 5 feet of slack at the mast arm simplex.
  5. Wavetronix APT Matrix Type 2 Home Run cable. For each detector provide a cable of length to run from the in-line terminal enclosure at the pole base handhole to the cabinet interface system inside the controller cabinet. Provide 15 feet of neatly coiled slack cable in the base of the controller foundation. Provide sufficient slack at pole, so the in-line terminal enclosure can be pulled out of the handhole for maintenance work.
     1. Smartsensor Cable Junction Box. For each Wavetronix digital wave radar vision system radar sensor, provide a Type 4X cable junction box enclosure to connect the Wavetronix 6-conductor pigtail cable to the APT Matrix 2 homerun cable.
     2. Wavetronix SmartSensor 6-conductor cable. For each Wavetronix digital wave radar vision system detector provide a cable of length indicated in the plans.

1. Pan-Tilt-Zoom (PTZ) Camera. Furnish an Axis Q6010-E Camera with the following specifications:
   1. Furnish an Axis Q6010-E 60 Hz Camera with the following specifications:
2. Micro SDXC card with a capacity of 256GB and speed class U3 or V30
   1. Furnish an Axis Q6075-E PTZ Dome network camera 60Hz camera with the following specifications:
3. Power with Axis High PoE midspan 1-port 100-240 V AC, max 60 W.
4. Micro SDXC card with a capacity of 256GB and speed class U3 or V30.
   1. Include T91 mounting accessories.
   2. Include T94A01C attachment kit.

**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 Federal Standard 595b-37038.

* 1. 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.
        + 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. 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.

* + - * 1. Design Qualification and Quality Assurance Testing by an Independent Lab. Have ETL/Intertek or other approved OSHA “Nationally Recognized Testing Laboratory” do the following:

Perform an initial assessment of the manufacturer’s factory, engineering and manufacturing systems, and procedures to confirm compliance with ISO 9000.

Perform initial Design Qualification Testing as specified in Section 6.4 of the applicable ITE specification.

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*

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.

* + 1. 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.

* 1. Lens. Use only clear lenses for all green signal modules. Use lenses that meet the requirements of the applicable ITE Specification.
  2. Housing.
     1. Use polycarbonate housing material, meeting latest version of ITE equipment standards, 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.
  3. 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.

* 1. 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.

* 1. 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 Federal Standard 595b-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.

* 1. 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.
  2. 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.
  3. 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):
        + 1. WALKING PERSON 2,200 cd/m2,
          2. UPRAISED HAND 1,400 cd/m2,
          3. 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:
        + 1. Manufacturer’s name, trademark, and other necessary identification
          2. Warranty information
          3. Rated voltage and power consumption in volt-amperes
          4. An up arrow or the word “UP” or “TOP” for orientation within a signal housing.
  4. 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 8.0 watts, Digits 10.0 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.
  5. 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:
        + 1. Perform an initial assessment of the manufacturer’s factory, engineering and manufacturing systems, and procedures to confirm compliance with ISO 9000.
          2. Perform initial Design Qualification Testing as specified in Section 6.4 of the PTCSI-04.
          3. 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*

* + - * 1. 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.
  1. 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.

* 1. 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.

1. Housing
   1. Provide signal housings that have a maximum overall dimensions of 18-1/2 inches wide, 18-3/4 inches high, and 9 inches deep.
   2. Provide a dustproof and weatherproof housing that allows easy access to and replacement of all components.
   3. 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.
   4. 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.
      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.
      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.
   5. 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.
2. Conductors: Meet IMSA specifications 20-1 with No. 14 AWG or larger.
3. Load Switches: Place all load switches for operation of pedestrian signals in the controller cabinet.
4. Fasteners. Use machine screws, studs, and washers that are stainless steel.
5. Gaskets: Use gaskets that conform to ASTM D1056, Grade 2C2.
6. Terminal Blocks: Provide a rain tight terminal compartment with a 12 position terminal block.
7. 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 Federal Standard 595b-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 RBDLM2-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:

Switching unit that is solid state electronic piezo rated for 100 million cycles.

Sealed to prevent ice from impeding function.

Must hold the call for a minimum of 5 seconds.

Switch operating force of 3 pounds or less with no moving plunger or moving electrical contacts.

Provide an LED indication and an audible tone or beep within the button when pushed, at a minimum 68 db. at 1 meter.

Must have a raised rim or ridges to protect the button from side impacts.

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:

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.

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.

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.

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.

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.

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.

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 ROADWAY LUMINAIRES**. Furnish 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.

Luminaries General

Install luminaires that feature:

1. 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.
2. 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.
3. 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.
4. Glass lenses, unless polycarbonate resin refractors are specified.
5. Terminal blocks for attaching the illumination tap conductors.
6. Aluminum reflectors with an ALZAK or ALGLAS finish when using HPS fixtures.
7. Optical components free of substances that affect photometric performance, paint.
8. Housings cast with no provision for a photoelectric control receptacle.
9. 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.
10. For HPS fixtures include plug in starting aids with lamps through 400 watts.
11. Luminaries – 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:

* 1. An easily removed hinged door used exclusively for mounting the ballast.
  2. 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.
  3. 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.

1. Luminaires - LED
   1. 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.
   2. 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.
   3. 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 (+/- 300 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.

* + 1. 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.
    2. 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).
  1. 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 driver door. 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.
  1. 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.

* 1. 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.
  2. 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.

* 1. 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.

1. 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.
   1. Hood. Cadmium plated, finished with aluminum paint, and side outlet tapped for conduit.
   2. Reflector. Symmetrical 8-inch steel. Porcelain enameled green finish on the outside and white on the inside.
   3. 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.
   1. 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.
   2. 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.
   3. Gaskets. Made of a material capable of withstanding the temperatures involved, and securely held in place.
   4. 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.
   5. Miscellaneous. All ballasts, lampholders, lamps, terminal blocks, and necessary fuses must conform to applicable requirements of Subsection 740-2.21 or to the Plans.
   6. Lamps. Color-improved to provide good color rendition of signs.

**740-2.20 ILLUMINATION CONTROL.**  Use 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:

* 1. A supply voltage rating of 60 Hz, 105-277 volts
  2. A maximum rated load at a minimum of 1,800 volt-amperes
  3. An operating temperature range from -40 °F to +150 °F
  4. A power consumption of less than 10 watts
  5. A unit base with a 3-prong, 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*.

1. Temperature Switch. When mercury vapor sign lighting fixtures are used, provide a temperature switch in each photoelectric control circuit for lighting systems which will:
   1. bypass the photoelectric unit when the ambient temperature drops to -13 °F, and energize the mercury vapor light circuits;
   2. return switching functions to the photoelectric unit upon a temperature rise of 5 to 10 °F above the turn-on temperature; and
   3. 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 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.

**740-2.23 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).

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:

1. Comply with FCC part 15 and IC RSS-210 rules/regulations.
2. Support and provide the following wireless protocols:
   * 1. IEEE 802.11a (OFDM)
     2. IEEE 802.11n (MIMO 2x2:2, OFDM)
     3. Proprietary Wireless Protocol
3. 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
4. All Radios shall contain embedded GPS for automatic Geo-location of fixed or mobile wireless locations.
5. Integrated Panel Antennas must contain an external status panel which combines Received Signal Strength Indicators (RSSI), Power Indicator, and a Reset Button.
6. 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.
7. Any Radio shall be configurable as an Access Point, Remote, Repeater and Mesh Node.
8. The manufacturer and/or supplier of the Radio will be located in the North America with performance testing over the Radio’s operating temperatures of -40° to +85 C. Shall be IP67 and NEMA exceeding environmental specifications.
9. 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:
10. 802.11i WPA/WPA2 (PSK, EAP), AES-CCM, TKIP, 802. 1X, RSN.
11. Radius Authentication
12. MAC Access Control List
13. User Login Controls
    * 1. Support the minimum IEEE Networking Features:
14. 802.11e (WMM & QoS)
15. 802.11h (DFS & TPC)
16. 802.1d (Ethernet Bridging)
17. 802.1p (Traffic Prioritization)
18. 802.1q (VLAN)
19. 802.1w (Rapid Spanning Tree)
20. 802.3ac (802.1q & 802p support)
21. 802.3ad (Link Aggregation)
22. 802.3x (Full Duplex and Flow Control)
    * 1. Minimum Wireless Software Features:
23. Automatic Geolocation of embedded GPS radios
24. Icon roll over feature displays latitude and longitude coordinates of radios
25. Customizable Menu Interface
26. Automatically discover, organize, configure radios in network tree
27. Provide a “Drag and Drop” radio configuration tool
28. A color coded display of network-wide wireless diagnostics illustrated on map
29. Data Rate, RSSI, Client Connection Quality
30. Provide Wireless Alert Reporting
31. A unique slider control allowing users to adjust upper and lower alert limits
32. Network Management Capabilities
    * 1. Firewall, ARP/Bridge Tables, Spanning Tree, Data Throughput
      2. IP Discovery, IP/Subnet Configuration, IP Conflict Tool
      3. Ping Watchdog
33. Real-time wireless diagnostic tools
34. Bandwidth Test Tool, RSSI and CCQ
35. Spectrum Analysis with AP Scan Tool
36. Audio Antenna Aiming Tool
37. 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

Copper and Fiber Ethernet Switch Furnish the number and type Siemens RuggedCom Ethernet Switch or approved equal meeting or exceeding the following specifications. Provision switch with ROS 5.4.2 or higher. Populate all SFPs with 1000LX (Gb) 1310nm single mode 10km LC connector or Gb RJ45 copper connector modules as specified per table. All SFP modules must be industrially rated to operate between -40C and 85C.

a. Requirements:

|  |  |  |  |
| --- | --- | --- | --- |
| Model | RS900G (32MB) | RSL910 | RSG920P |
| (1) **Power Supply** |  |  |  |
| Power Consumption (Max) | 10W | 13W | 27W |
| HI Supply Voltage AC/DC | 85-264VAC | 85-264VAC | 85-264VAC |
|  |  |  |  |
| (2) **Physical & Environmental** |  |  |  |
| Height mm | 188 | 188 | 177 |
| Width mm | 66 | 66 | 152 |
| Depth mm | 127 | 125 | 166 |
| Weight kg | 1.2 | 1.1 | 4.7 |
| Oper Temp Range -40C to 85C | fanless | fanless | fanless |
| Ingress Protection | IP40 | IP30 | IP40 |
| Enclosure | 20 AWG galvanized | 20 AWG galvanized | Cast Aluminum |
| Mounting | DIN rail mounted | DIN rail mounted | DIN rail mounted |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| (3) **Switch Properties** |  |  |  |
| Switching method: Store & Forward | Req | Req | Req |
| Switching latency us | 7 (100Mbps) | 8 (100Mbps) | 4 us |
| Switching bandwidth, Gbps | 5.6 | 2.8 | 108 |
| Priority Queues | 4 | 4 |  |
| Frame buffer memory |  | 1 Mbit |  |
| 255 Simultaneous VLANs | Req | Req | Req |
| VLAN ID Range 1-4096 | Req | Req | Req |
| IGMP and static multicast groups |  | 256 |  |
| Port rate limiting: 128kbps, 256, 512, 4, 8Mbps | Req | Req | Req |
| No head of line blocking | Req | Req | Req |
| Non Blocking Ethernet Ports RJ-45 (speed) | 8 (10/100) | 6 (10/100) | 12 (Gb) |
| Non Blocking Gb SFP Ports | 0 | 2 | 4 |
| Non Blocking Gb POE ports | 0 | 0 | 4 |
| VDSL2 Ports | 0 | 2 | 0 |
| Non Blocking Gb SC Transceiver | 2 (1310nm, 10km) | 0 | 0 |
| (4) **Approvals** |  |  |  |
| CE Marking | Req | Req | Req |
| Emissions: FCC Part 15 (Class A), EN55022 (CISPR22 Class A) | Req | Req | Req |
| Safety: cCSAus (Compliant with CSA C22.2 No. 60950, UL 60950, EN60950) | Req | Req | Req |
| Laser Eye Safety (FDA/CDRH): Complies with 21 CFR, Chapter1, Subchapter J. | Req | Req | Req |
|  |  |  |  |
| (5) **EMI Immunity and Environmental Compliance** |  |  |  |
| IEEE 1613 Electric Utility Substations | Req | Req | Req |
| NEMA TS 2 Traffic Control Equipment | Req | Req | Req |
|  |  |  |  |
| (6) **Network Management** |  |  |  |
| HTTP graphical web-based, SSL (128-bit encryption) | Req | Req | Req |
| SNMP v1, v2c, v3 (56-bit encryption) | Req | Req | Req |
| Telnet, SSH | Req | Req | Req |
| Command Line Interface (CLI) | Req | Req | Req |
| RSA Key Management (1024 bit key) | Req | Req | Req |
| Authentication and Accounting - TACACS+ (encrypted), | Req | Req | Req |
|  |  |  |  |
| (7) **Warranty** |  |  |  |
| 5 Years-Applicable to design or manufacturing related product defects. | Req | Req | Req |
|  |  |  |  |
| (8) **IEEE Compliance** |  |  |  |
| 802.3-10BaseT | Req | Req | Req |
| 802.3u-100BaseTX, 100BaseFX | Req | Req | Req |
| 802.3x-Flow Control | Req | Req | Req |
| 802.3z-1000BaseLX | Req | Req | Req |
| 802.3ab-1000BaseT | Req | Req | Req |
| 802.3ad-Link Aggregation | Req | Req | Req |
| 802.1D-MAC Bridges | Req | Req | Req |
| 802.1D-Spanning Tree Protocol | Req | Req | Req |
| 802.1p-Class of Service | Req | Req | Req |
| 802.1Q-VLAN Tagging | Req | Req | Req |
| 802.1D-2004 -Rapid Spanning Tree Protocol | Req | Req | Req |
| 802.1x-Port Based Network Access Control | Req | Req | Req |
| 802.1Q-2005 (formerly 802.1s) MSTP | Req | Req | Req |
|  |  |  |  |
| (9) **IETF RFC Compliance** |  |  |  |
| RFC768-UDP | Req | Req | Req |
| RFC783-TFTP | Req | Req | Req |
| RFC791-IP | Req | Req | Req |
| RFC792-ICMP | Req | Req | Req |
| RFC793-TCP | Req | Req | Req |
| RFC826-ARP | Req | Req | Req |
| RFC854-Telnet | Req | Req | Req |
| RFC894-IP over Ethernet | Req | Req | Req |
| RFC1112-IGMP v1 | Req | Req | Req |
| RFC1519-CIDR | Req | Req | Req |
| RFC1541-DHCP (client) | Req | Req | Req |
| RFC2030-SNTP | Req | Req | Req |
| RFC2068-HTTP | Req | Req | Req |
| RFC2236-IGMP v2 | Req | Req | Req |
| RFC2284-EAP | Req | Req | Req |
| RFC2475-Differentiated Services | Req | Req | Req |
| RFC2865-RADIUS | Req | Req | Req |
| RFC3414-SNMPv3-USM | Req | Req | Req |
| RFC3415-SNMPv3-VACM | Req | Req | Req |
|  |  |  |  |
| (10) **IETF SNMP MIBS** |  |  |  |
| RFC1659-RS-232-MIB | Req | Req | Req |
| RFC1907-SNMPv2-MIB | Req | Req | Req |
| RFC2011-IP-MIB | Req | Req | Req |
| RFC2012-TCP-MIB | Req | Req | Req |
| RFC2013-UDP-MIB | Req | Req | Req |
| RFC2578-SNMPv2-SMI | Req | Req | Req |
| RFC2579-SNMPv2-TC | Req | Req | Req |
| RFC2580-SNPv2-CONF | Req | Req | Req |
| RFC2580-IANAifType | Req | Req | Req |
| RFC2819-RMON-MIB | Req | Req | Req |
| RFC2863-IF-MIB | Req | Req | Req |
| RFC3411-SNMP-FRAMEWORK-MIB | Req | Req | Req |
| RFC3414-SNMP-USER-BASED-SM-MIB | Req | Req | Req |
| RFC3415-SNMP-VIEW-BASED-ACM-MIB | Req | Req | Req |
| RFC4188-BRIDGE-MIB | Req | Req | Req |
| RFC4318-RSTP-MIB | Req | Req | Req |
| RFC4363-Q-BRIDGE-MIB | Req | Req | Req |
| IEEE8023-LAG-MIB | Req | Req | Req |
| IEEE8021-LLDP-MIB | Req | Req | Req |

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