PART 4

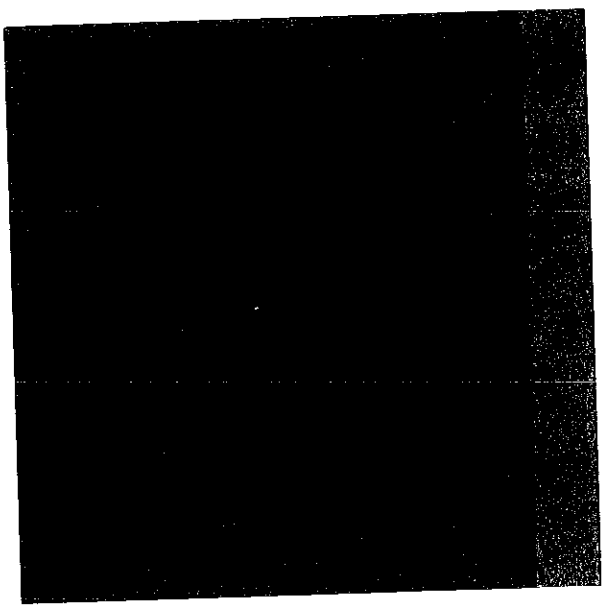
STANDARD MODIFICATIONS

AND SPECIAL PROVISIONS

to the STATE OF ALASKA

SPECIFICATIONS
FOR
HIGHWAY CONSTRUCTION

2004 STANDARD SPECIFICATIONS



CVISN Deployment Plan, Construction - 2004
Project No. ITS-MGE-9802(3)/56944

SECTION 101

DEFINITIONS AND TERMS

Standard Modifications

101-1.03 DEFINITIONS. Replace the definitions of SUBGRADE with the following:

SUBGRADE. The soil or embankment upon which the pavement structure is constructed. E22(1/1/06)

SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

Special Provisions

102-1.01 QUALIFICATION OF BIDDERS. After the last paragraph add the following paragraph: An Electrical Administrator, or a person whose Electrical Administrator's license is assigned to the Contractor must be employed by the Contractor under AS 08.40 at the time designated for bid opening. ES08(6/30/04)

Standard Modification

102-1.05 PREPARATION OF BID. Modify the second sentence in the third paragraph, after: "If a bidder is a corporation, the bid must be signed by a corporate officer," add: or agent. (06/30/04)E18

SECTION 105

CONTROL OF WORK

Special Provisions

105-1.06 COOPERATION WITH UTILITIES. Add the following: 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.
Statewide 800-478-3121 who will notify the following:
ACS Alaska Fiber Star Alaska Railroad Corp. Anchorage Water & Wastewater Utility (AWWU) Chugach Electric Assoc. DOT Street Lights, State of Alaska Enstar Natural Gas General Communications Inc. (GCI) Matanuska Electric Association (MEA) Matanuska Telephone Association (MTA) Municipal Light & Power

Call the following utilities and agencies directly:

Contact the Central Region Maintenance & Operations Office at (907) 269-0760 to obtain the appropriate District Superintendent's phone number for this project.

The U.S. Army provides electrical power to the Glenn Highway Weigh Station facilities and adjacent roadway lighting system. For utility locates, contact the Fort Richardson Customer Service Desk, Bldg. 730, at 384-3177 or 384-3664.

There are various utility appurtenances located within the project limits. Utilities scheduled for relocation are addressed in the following utility specific sections.

Right of Way and/or Construction surveying is required before any utility relocation.

Payment will be made as follows:

1. Subsidiary to Item 642(1), Construction Surveying, if the Contractor is required to provide the surveying as part of the contract an/or

2. Under 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 two (2) week work plan, or not required by the contract.

The utility shall give the Contractor, through the Engineer, 15 calendar days advance written notice for required staking. (09/01/04)R3

A copy of Enstar's **Safety Requirements for Excavation Adjacent to Natural Gas Pipelines** is included in Appendix C to the Special Provisions to familiarize contractors with safe excavation methods while working close to gas pipelines.

Standard Modification

105-1.16 FINAL ACCEPTANCE AND RECORD RETENTION. Modify the first paragraph, Item 4., after: "DOLWD" add: and State Department of Revenue. (06/30/04)E19

Special Provision

105-1.17 CLAIMS. Add the following Any appeal to the superior court under AS 36.30.685 must be filed in the third judicial district. (3/21/01)R93

SECTION 106

CONTROL OF MATERIAL

Special Provisions

106-1.01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. Add the following:

Buy America Provision. Comply with the requirements of 23 CFR 635.410, Buy America Requirements, and shall submit a completed Material Origin Certificate, Form 25D-60, before award of the contract.

Steel and iron products which are incorporated into the work, shall be manufactured in the United States except that minor amounts of steel and iron products of foreign manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent (0.001) of the total contract amount, or $2500, whichever is greater. For the purposes of this paragraph, the cost is the value of the products as they are delivered to the project including freight.

"Manufactured in the United States" means that all manufacturing processes starting with the initial mixing and melting through the final shaping, welding, and coating processes must be undertaken in the United States. The definition of "manufacturing process" is smelting or any subsequent process that alters the material's physical form, shape or chemical composition. These processes include rolling, extruding, machining, bending, grinding, drilling, etc. The application of coatings, such as epoxy coating, galvanizing, painting or any other coating that protects or enhances the value of steel or iron materials shall also be considered a manufacturing process subject to the "Buy America Requirements."

Buy America does not apply to raw materials (iron ore), scrap, pig iron, and processed, pelletized and reduced iron ore. It also does not apply to temporary steel items (e.g., temporary sheet piling, temporary bridges, steel scaffolding, and falsework). Further, it does not apply to materials that remain in place at the Contractor's convenience (e.g., sheet pilings, and forms).

The North American Free Trade Agreement (NAFTA) does not apply to the Buy America requirement. There is a specific exemption within NAFTA (article 1001) for grant programs such as the Federal-aid highway program.

When steel and iron products manufactured in the United States are shipped to a foreign country where non-steel or iron products are installed on or in them (e.g., electronic components in a steel cabinet), the steel and iron is considered to meet the requirements of this subsection.

Take whatever steps are necessary to ensure that manufacturing processes for each covered product comply with this provision. Non-conforming products shall be

replaced at no expense to the State. Failure to comply may also subject the Contractor to default and/or debarment. False statements may result in criminal penalties prescribed under Title 18 US Code Section 1001 and 1020. (02/07/05)S13

Standard Modification

106-1.02 MATERIAL SOURCES.

1. a. General. Within Item a. delete text and replace with: Utilize Useable Excavation according to subsection 104-1.04 before using material sources listed in subsection 106-1.02.4. When there is insufficient useable excavation furnish additional required materials from sources of the Contractor's choice, except that the Contractor shall use a mandatory source when identified in the Contract.

4. Type of Sources. Replace the first paragraph with the following: The Contractor shall utilize Useable Excavation according to subsection 104-1.04 before using material sources listed in this subsection. When there is insufficient Useable Excavation, the Contractor shall furnish additional required materials from sources of the Contractor's choice, except that the Contractor shall use a mandatory source when identified in the Contract.

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

4. d. Available Sources. Replace the second paragraph with the following: When the Department furnishes copies of existing boring logs, test results, or other data in its possession concerning Available Sources, the Contractor is responsible for determining the accuracy and completeness of this data, for assumptions the Contractor makes based on this data, and for exploring Available Sources to the Contractor's satisfaction.

4. e. Excluded Material Sources. Replace the paragraph with the following: Some material sources may not be considered acceptable regardless of location or ownership. The bid documents may identify some material sources excluded from use. The Department reserves the right to exclude a material sources or any portion of a material source, at any time after Contract award, that is determined by material testing to be unsuitable for use on the project. E24(1/1/06)

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Special Provisions

107-1.02 PERMITS, LICENSES, AND TAXES. Add the following: Obtain a written statement from the State Historic Preservation Officer stating that material disposal, extraction, stockpiling or staging, on off project site, is not expected to impact cultural resources. The State Historic Preservation Officer is with the Department of Natural Resources in Anchorage, and may be contacted at (907) 269-8715. If cultural resources are discovered during construction activities, stop work at that site and notify the Engineer.

Provide a wetland specialist able to conduct wetlands determinations and delineations according to the Corps of Engineers 1987 Wetland Delineation Manual. 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.

Provide the Engineer a copy of permits or clearances received before using sites outside the project limits. Additionally, provide the Engineer a written statement that permits or clearances have been obtained. Also provide a written statement to the Engineer listing agencies or offices contacted that responded that no additional action is required.

(05/29/02)R7M98

107-1.07 ARCHAEOLOGICAL OR HISTORICAL DISCOVERIES. Change the first sentence to the following: When operations 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. (05/29/02)R7M98

107-1.11 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. Add the following: If you require water for construction purpose from a non-municipal 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) 269-8624. (05/29/02)R7M98

Add the following subsection:

107-1.21 FEDERAL AFFIRMATIVE ACTION. The Federal Equal Employment Opportunity, Disadvantaged Business Enterprise, and On-the-Job Training

affirmative action program requirements that are applicable to this Contract are contained in the project Special Provisions and Contract Forms, and may include:

Disadvantaged Business Enterprise (DBE) Program	Section 120
Training Program	Section 645
Federal EEO Bid Conditions	Form 25A-301
EEO-1 Certification	Form 25A-304
DBE Subcontractable Items	Form 25A-324
ADOT&PF Training Program Request	Form 25A-310
Training Utilization Report	Form 25A-311
Contact Report	Form 25A-321A
DBE Utilization Report	Form 25A-325C
Summary of Good Faith Effort Documentation	Form 25A-332A
Required Contract Provisions, Federal-Aid Contracts	Form 25D-55

In addition to the sanctions provided in the above references, non-compliance with these requirements is grounds for withholding of progress payments. (01/22/02)S80

SECTION 108

PROSECUTION AND PROGRESS

Special Provisions

108-1.03 PROSECUTION AND PROGRESS. Delete the last sentence of the first paragraph and substitute the following: Submit the following at the Preconstruction Conference:

Delete item 1. A progress schedule. and substitute the following:

1. A Critical Path Method (CPM) Schedule is required, in a format acceptable to the Engineer, showing the order the work will be carried out and the contemplated dates the Contractor and subcontractors will start and finish each of the salient features of the work, including scheduled periods of shutdown. Indicate anticipated periods of multiple-shift work in the CPM Schedule. Revise 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. (12/13/02)R261M98

108-1.06 CONTRACT TIME, EXTENSION OF CONTRACT TIME AND SUSPENSION OF WORK. Add the following:

5. Long Lead Items. The Contractor shall provide the Engineer with copies of purchase orders for electrical items (poles and mast arms) within 20 calendar days after receipt of Notice to Proceed. Include the estimated delivery date to Anchorage, Alaska for electrical items in the Purchase Order.

   Upon delivery of electrical items, the Contractor shall provide a copy of the delivery order to the Engineer. The Contractor has 45 days from delivery of electrical items to complete associated work. If the project is not completed within the 45 days liquidated damages will be assessed at 25% of values according to subsection 108-1.07 Failure to Complete on Time.

   The Contractor is responsible for maintenance of the project until Contract Time is suspended or the project is completed.

SECTION 109

MEASUREMENT AND PAYMENT

Special Provisions

109-1.02 MEASUREMENT OF QUANTITIES. Under subtitle Electronic Computerized Weighing System item (1) add the following to the end of the first sentence: ", CD, or a USB device."

109-1.05 COMPENSATION FOR EXTRA WORK. 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. (4/31/05)R14

109-1.07 PAYMENT FOR MATERIAL ON HAND. Add the following under item 3:

c. The location of stockpiled materials for payment in acceptable storage facilities off the project will be in Alaska, at a location acceptable to the Engineer. (09/01/89)R16

Standard Modification

109-1.08 FINAL PAYMENT. Add the following sentence to the first paragraph: The Department will not process the final estimate until the Contractor completes Items 1 through 4 in the first paragraph of subsection 105-1.16. (06/30/04)E11

Add the following Section:

SECTION 120

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM

Special Provisions

120-1.01 DESCRIPTION. The work consists of providing Disadvantaged Business Enterprises (DBEs), as defined in Title 49, CFR (Code of Federal Regulations), Part 26, with the opportunity to participate on an equitable basis with other contractors in the performance of contracts financed in whole, or in part, with federal funds. The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of USDOT assisted contracts.

120-1.02 INTERPRETATION. It is the intent of this section to implement the requirements of 49 CFR, Part 26, and the Department's federally approved DBE Program.

120-1.03 ESSENTIAL CONTRACT PROVISION. Failure to comply with the provisions of this section will be considered a material breach of contract, which may result in the termination of this contract or such other remedy as ADOT&PF deems appropriate. The Department also considers failure to comply with this section to be so serious as to justify debarment action as provided in AS 36.30.640(4).

120-1.04 DEFINITIONS AND TERMS. The following definitions will apply.

1. Broker. A DBE certified by the Department that arranges for the delivery or provision of creditable materials, supplies, equipment, transportation/hauling, insurance, bonding, etc., within its certified category, that is necessary for the completion of the project. A broker of materials certified in a supply category must be responsible for scheduling the delivery of materials and fully responsible for ensuring that the materials meet specifications before credit will be given.

2. Commercially Useful Function (CUF). The execution of the work of the Contract by a DBE carrying out its responsibilities by actually performing, managing, and supervising the work involved using its own employees and equipment. The DBE shall be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quality and quantity, ordering the material, and installing (where applicable) and paying for the material itself. To determine whether a DBE is performing a commercially useful function, an evaluation of the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing

and the DBE credit claimed for its performance of the work. Other relevant factors will be considered. The Engineer makes the determination of CUF after evaluating the way in which the work was performed during the execution of the Contract.

3. Disadvantaged Business Enterprise (DBE). An enterprise which is a for-profit small business concern

   a. that is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock is owned by one or more such individuals;

   b. whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it; and

   c. has been certified by the Department in accordance with 49 CFR, Part 26.

4. DBE Key Employee. Permanent employees identified by the DBE owner in its certification file in the Department Civil Rights Office.

5. DBE Utilization Goal. The percent of work to be performed by certified DBEs that is established by the Department and specified in the Contract.

6. Good Faith Efforts. Efforts by the bidder or Contractor to achieve a DBE goal or other requirement of 49 CFR Part 26, by their scope, intensity, and appropriateness to the objective, that can reasonably be expected to fulfill the program requirement.

7. Manufacturer. A DBE certified by the Department in a supply category that changes the shape, form, or composition of original material in some way and then provides that altered material to the project and to the general public or the construction industry at large on a regular basis.

8. Notification. For purposes of soliciting DBE participation on a project and to count toward a contractor's Good Faith Efforts, notification shall be by letter or fax transmission, with a return receipt requested or successful transmission report. Telephonic contact with a DBE may be allowed, however it shall be based on the ability of Civil Rights staff to independently verify this contact.

9. Regular Dealer. A DBE certified by the Department in a supply category that

   a. maintains an in-house inventory on a regular basis of the particular product provided to this project; and

   b. keeps an inventory in an amount appropriate for the type of work using that product; and

   c. offers that inventory for sale to the general public or construction industry at large (private and public sectors), not just supplied as needed on a project by project basis during the construction season, except where the product requires special or heavy equipment for delivery and the DBE possesses and operates this equipment on a regular basis throughout the construction season in order to deliver the product to the general public or construction industry at large. If the distribution equipment is rented or leased, it must be on a repetitive, seasonal basis; and may additionally

   d. fabricate (assembles large components) for use on a construction project, consistent with standard industry practice, for delivery to the project.

120-2.01 UTILIZATION GOAL. The DBE Utilization Goal for this contract is shown on Form 25A324 (DBE Subcontractable Items) as a percentage of the total basic bid amount. A DBE may be considered creditable towards meeting the DBE Utilization Goal at time of Contract award, if the DBE is certified by the Department in a category covering the CUF to be performed at the time of listing on Form 25A325C (DBE Utilization Report).

A bidder shall demonstrate the ability to meet the DBE Utilization Goal or perform and document all of the required Good Faith Efforts under Subsection 120-3.02 in order to be eligible for award of this Contract.

If the quantity of work of a bid item involving a DBE firm is reduced by the Department, the DBE Utilization Goal on Form 25A325C will be reduced proportionately.

120-3.01 DETERMINATION OF COMPLIANCE

1. Phase I - Bid. Each bidder must register with the Civil Rights Office annually in accordance with §§26.11 & 26.53(b)(2)(iv) of 49 CFR, Part 26. No contract may be awarded to a bidder that is not registered.

2. Phase II - Award. The apparent low bidder will provide the following within 15 days of receipt of notice of intent to award:

   a. **Written DBE Commitment**. Written commitments from DBEs to be

used on the project. The written commitment shall contain the following information:

1) A description of the work that each DBE will perform;

2) The dollar amount of participation by the DBE firm;

3) Written documentation of the bidder/offeror's commitment to use a DBE subcontractor whose participation it submits to meet a contract goal; and

4) Written confirmation from the DBE that it is participating in the contract as provided in the prime Contractor's commitment.

b. **DBE Utilization Report.** Form 25A325C listing the certified DBEs to be used to meet the DBE Utilization Goal.

c. **Good Faith Effort Documentation.** Summary of Good Faith Effort Documentation (Form 25A332A and attachments) and DBE Contact Reports (Form 25A321A) if the Contractor submits less DBE utilization on Form 25A325C than is required to meet the DBE Utilization Goal. If accepted by the Department, this lower DBE utilization becomes the new DBE Utilization Goal. If the bidder cannot demonstrate the ability to meet the DBE Utilization Goal, and can not document the minimum required Good Faith Efforts (as outlined in subsection 120-3.02 below), the Contracting Officer will determine the bidder to be not responsible.

3. Phase III - Construction.

a. **Designation of DBE/EEO Officer.** At the preconstruction conference, the Contractor shall submit, in writing, the designation of a DBE/EEO officer.

b. **DBE Creditable Work.** The CUF work items and creditable dollar amounts shown for a DBE on the DBE Utilization Report (Form 25A325C) shall be included in any subcontract, purchase order or service agreement with that DBE.

c. **DBE Replacement.** If the Engineer approves a DBE replacement, the Contractor shall replace the DBE with another DBE for the same work in order to fulfill its commitment under the DBE Utilization Goal. In the event that the Contractor cannot obtain replacement DBE participation, the Engineer may adjust the DBE Utilization Goal if, in the opinion of the Engineer and the Civil Rights Office, both of the following criteria have been met:

1) The Contractor has not committed any discriminatory practice in its exercise of good business judgment to replace a DBE.

2) If the Contractor is unable to find replacement DBE participation and has adequately performed and documented the Good Faith Effort expended in accordance with Subsection 120-3.02.

d. **DBE Utilization Goal.** The DBE Utilization Goal will be adjusted to reflect only that amount of the DBE's work that cannot be replaced.

120-3.02 GOOD FAITH EFFORT

1. **Good Faith Effort Criteria.** The Contracting Officer will use the following criteria to judge if the bidder, who has not met the DBE Utilization Goal, has demonstrated sufficient Good Faith Effort to be eligible for award of the contract.

Failure by the bidder to perform and document all of the following actions constitutes insufficient Good Faith Effort.

a. Consideration of all subcontractable items. The bidder shall, at a minimum, seek DBE participation for each of the subcontractable items upon which the DBE goal was established as identified by the Department (on Form 25A324) prior to bid opening. It is the bidder's responsibility to make the work listed on the subcontractable items list available to DBE firms, to facilitate DBE participation.

b. If the bidder can not achieve the DBE Utilization Goal using the list of available DBE firms based on the subcontractable items list, then the bidder may consider other items that could be subcontracted to DBEs.

c. Notification to all active DBEs listed for a given region in the Department's most current DBE Directory at least 7 calendar days prior to bid opening. The bidder must give the DBEs no less than five days to respond. The bidder may reject DBE quotes received after the deadline. Such a deadline for bid submission by DBEs will be consistently applied. DBEs certified to perform work items identified on Form 25A324 must be contacted to solicit their interest in participating in the execution of work with the Contractor. Each contact with a DBE firm will be logged on a Contact Report (Form 25A321A).

d. The bidder may reject non-competitive DBE quotes. Allegations of non-competitive DBE quotes must be documented and verifiable. A DBE quote that is more than 10.0 percent higher than the accepted non-DBE quote will be deemed non-competitive, provided the DBE and non-DBE subcontractor quotes are for the exact same work or service. Bidders must have a non-DBE subcontractor quote for comparison purposes. Such evidence shall be provided in support of the bidder's allegation. Where the bidder rejects a DBE quote as being non-competitive under this condition, the work must be performed by the non-DBE subcontractor and payments received by the non-DBE subcontractor during the execution of the Contract shall be consistent with the non-DBE's accepted quote. This does not preclude increases as a result of Change documents issued by the Department.

e. Provision of assistance to DBEs who need help in obtaining information about bonding or insurance required by the bidder.

f. Provision of assistance to DBEs who need help in obtaining information about securing equipment, supplies, materials, or related assistance or services.

g. Providing prospective DBEs with adequate information about the requirements of the Contract regarding the specific item of work or service sought from the DBE.

h. Follow-up of initial notifications by contacting DBEs to determine whether or not they will be bidding. Failure to submit a bid by the project bid opening or deadline by the bidder is de facto evidence of the DBE's lack of interest in bidding. Documentation of follow-up contacts shall be logged on the Contact Report (Form 25A321A).

i. Items c through h will be utilized to evaluate any request from the Contractor for a reduction in the DBE Utilization Goal due to the default or decertification of a DBE and the Contractor's subsequent inability to obtain additional DBE participation.

2. **Administrative Reconsideration**. Under the provisions of 49 CFR. Part 26.53(d), if it is determined that the apparent successful bidder has failed to meet the requirements of this subsection, the bidder must indicate whether they would like an opportunity for administrative reconsideration. The bidder must exercise such an opportunity within 3 calendar days of notification it has failed to meet the requirements of this subsection. As part of this reconsideration, the bidder must provide written documentation or argument concerning the issue of whether it met the goal or made adequate good faith efforts to do so.

   a. The DBE Liaison Officer will make the decision on reconsideration.

   b. The bidder will have the opportunity to meet in person with the DBE Liaison Officer to discuss the issue of whether it met the goal or made adequate good faith efforts to do so. If a meeting is desired, the bidder must be ready, willing and able to meet with the DBE Liaison Officer within 4 days of notification that it has failed to meet the requirements of this subsection.

   c. The DBE Liaison Officer will render a written decision on reconsideration and provide notification to the bidder. The written decision will explain the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so.

   d. The result of the reconsideration process is not administratively appealable to US DOT.

120-3.03 COMMERCIALLY USEFUL FUNCTION (CUF).

1. **Creditable Work**. Measurement of attainment of the DBE Utilization Goal will be based upon the actual amount of money received by the DBEs for creditable CUF work on this project as determined by the Engineer in accordance with this Section. CUF is limited to that of a:
   a. regular dealer;
   b. manufacturer;
   c. broker;
   d. subcontractor;
   e. joint-venture; or
   f. prime contractor.

2. **Determination of Commercially Useful Function.** In order for the CUF work of the DBE to be credited toward the goal, the Contractor will ensure that all of the following requirements are met:

   a. The CUF performed by a DBE certified in a supply category will be evaluated by the Engineer to determine whether the DBE performed as either a broker, regular dealer, or manufacturer of the product provided to this project.

   b. A DBE trucking firm certified and performing work in a transportation/hauling category is restricted to credit for work performed with its own trucks and personnel certified with the CRO prior to submitting a bid to a contractor for DBE trucking. The DBE trucking firm must demonstrate that it owns all trucks (proof of title and/or registration) to be credited for work and that all operators are employed by the DBE trucking firm. A DBE trucking firm that does not certify its trucks and personnel that it employs on a job will be considered a broker of trucking services and limited to credit for a broker. (This does not effect the CUF of that same firm, when performance includes the hauling of materials for that work.)

   c. The DBE is certified in the appropriate category at the time of

      1) the Engineer's approval of the DBE subcontract, consistent with the written DBE commitment; and

      2) the issuance of a purchase order or service agreement by the Contractor to a DBE performing as either a manufacturer, regular dealer, or broker (with a copy to the Engineer).

   d. The Contractor will receive credit for the CUF performed by DBEs as provided in this Section. Contractors are encouraged to contact the Engineer in advance of the execution of the DBE's work or provision of goods or services regarding CUF and potential DBE credit.

   e. The DBE may perform work in categories for which it is not certified, but only work performed in the DBE's certified category meeting the CUF criteria may be credited toward the DBE Utilization Goal.

   f. The work of the DBE firm must meet the following criteria when determining when CUF is being performed by the DBE:

      1) The work performed will be necessary and useful work required for the execution of the Contract.

2) The scope of work will be distinct and identifiable with specific contract items of work, bonding, or insurance requirements.

3) The work will be performed, controlled, managed, and supervised by employees normally employed by and under the control of the certified DBE. The work will be performed with the DBE's own equipment. Either the DBE owner or DBE key employee will be at the work site and responsible for the work.

4) The manner in which the work is sublet or performed will conform to standard, statewide industry practice within Alaska, as determined by the Department. The work or provision of goods or services will have a market outside of the DBE program (must also be performed by non-DBE firms within the Alaskan construction industry). Otherwise, the work or service will be deemed an unnecessary step in the contracting or purchasing process and no DBE credit will be allowed.

   There will be no DBE credit for lower-tier non-DBE subcontract work.

5) The cost of the goods and services will be reasonable and competitive with the cost of the goods and services outside the DBE program within Alaska. Materials or supplies needed as a regular course of the Contractor's operations such as fuel, maintenance, office facilities, portable bathrooms, etc. are not creditable.

   The cost of materials actually incorporated into the project by a DBE subcontractor is creditable toward the DBE goal only if the DBE is responsible for ordering and scheduling the delivery of creditable materials and fully responsible for ensuring that the materials meet specifications.

6) Unless the Engineer's approval is given before subletting, use the same unit of measure as contained in the Bid Schedule for subcontract work, with the exception of truck hauling.

7) The DBE will control all business administration, accounting, billing, and payment transactions. The prime contractor will not perform the business, accounting, billing, and similar functions of the DBE. The Engineer may, in accordance with AS 36.30.420(b), inspect the offices of the DBE and audit the records of the DBE to assure compliance.

g. On a monthly basis, the Contractor shall report on Form 25A336 (Monthly Summary of DBE Participation) to the Department Civil Rights Office the payments made (canceled checks or bank statements that identify payor, payee, and amount of transfer) for the qualifying work, goods and services provided by DBEs.

3. **Decertification of a DBE**. Should a DBE performing a CUF become decertified during the term of the subcontract, purchase order, or service agreement for reasons beyond the control of and without the fault or negligence of the Contractor, the work remaining under the subcontract, purchase order, or service agreement may be credited toward the DBE Utilization Goal.

Should the DBE be decertified between the time of Contract award and the time of the Engineer's subcontract approval or issuance of a purchase order or service agreement, the work of the decertified firm will not be credited toward the DBE Utilization Goal. The Contractor must still meet the DBE Utilization Goal by either

a. withdrawing the subcontract, purchase order or service agreement from the decertified DBE and expending Good Faith Effort (Subsection 120-3.02, Items c through h) to replace it with one from a currently certified DBE for that same work or service through subcontractor substitution (Subsection 103-1.01); or

b. continuing with the subcontract, purchase order or service agreement with the decertified firm and expending Good Faith Effort to find other work not already subcontracted out to DBEs in an amount to meet the DBE Utilization Goal through either

1) increasing the participation of other DBEs on the project;
2) documenting Good Faith Efforts (Subsection 120-3.02, items c through h); or
3) by a combination of the above.

4. **DBE Rebuttal of a Finding of no CUF**. Consistent with the provisions of 49 CFR, Part 26.55(c)(4)&(5), before the Engineer makes a final finding that no CUF has been performed by a DBE firm the Engineer will coordinate notification of the presumptive finding through the Civil Rights Office to the Contractor, who will notify the DBE firm.

   The Engineer, in cooperation with the Civil Rights Office, may determine that the firm is performing a CUF if the rebuttal information convincingly demonstrates the type of work involved and normal industry practices establishes a CUF was performed by the DBE. Under no circumstances shall the Contractor take any action against the DBE firm until the Engineer has made a final determination. The Engineer's decisions on CUF matters are not administratively appealable to US DOT.

120-3.04 DEFAULT OF DBE. In the event that a DBE firm under contract or to whom a purchase order or similar agreement has been issued defaults on their work for whatever reason, the Contractor shall immediately notify the Engineer of the default and the circumstances surrounding the default.

The Contractor shall take immediate steps, without any order or direction from the Engineer, to retain the services of other DBEs to perform the defaulted work. In the event that the Contractor cannot obtain replacement DBE participation, the Engineer may adjust the DBE Utilization Goal if, in the opinion of the Engineer, the following criteria have been met:

1. The Contractor was not at fault or negligent in the default and that the circumstances surrounding the default were beyond the control of the Contractor; and

2. The Contractor is unable to find replacement DBE participation at the same level of DBE commitment and has adequately performed and documented the Good Faith Effort expended in accordance with items c through h of Subsection 120-3.02 for the defaulted work; or

3. It is too late in the project to provide any real subcontracting opportunities remaining for DBEs.

The DBE Utilization Goal will be adjusted to reflect only that amount of the defaulted DBE's work that can not be replaced.

120-4.01 METHOD OF MEASUREMENT. The Contractor will be entitled to count toward the DBE Utilization Goal those monies actually paid to certified DBEs for CUF work performed by the DBE as determined by the Engineer. The Contractor will receive credit for the utilization of the DBEs, as follows:

1. Credit for the CUF of a DBE prime contractor is 100 percent of the monies actually paid to the DBE under the contract for creditable work and materials in accordance with 49 CFR 26.55.

2. Credit for the CUF of a subcontractor is 100 percent of the monies actually paid to the DBE under the subcontract for creditable work and materials. This shall include DBE trucking firms certified as a subcontractor and not a broker. Trucks leased from another DBE firm shall also qualify for credit and conforms to the provisions of 49 CFR 26.55(d).

3. Credit for the CUF of a manufacturer is 100 percent of the monies paid to the DBE for the creditable materials manufactured.

4. Credit for the CUF of a regular dealer of a creditable material, product, or supply is 60 percent of its value. The value will be the actual cost paid to the DBE but will not exceed the bid price for the item.

5. Credit for the CUF of a broker performed by a DBE certified in a supply category for providing a creditable material, product or supply is limited to a reasonable brokerage fee. The brokerage fee will not exceed 5 percent of the cost of the procurement contract for the creditable item.

6. Credit for the CUF of a broker performed by a DBE certified in the transportation/hauling category for arranging for the delivery of a creditable material, product or supply is limited to a reasonable brokerage fee. The brokerage fee will not exceed 5 percent of the cost of the hauling subcontract.

7. Credit for the CUF of a broker performed by a DBE certified in a bonding or insurance category for arranging for the provision of insurance or bonding is limited to a reasonable brokerage fee. The brokerage fee will not exceed 5 percent of the premium cost.

8. Credit for the CUF of a joint venture (JV) (either as the prime contractor or as a subcontractor) may not exceed the percent of the DBE's participation in the joint venture agreement, as certified for this project by the Department. The DBE joint venture partner will be responsible for performing all of the work as delineated in the certified JV agreement.

120-5.01 BASIS OF PAYMENT. Work under this item is subsidiary to other contract items and no payment will be made for meeting or exceeding the DBE Utilization Goal.

If the Contractor fails to utilize the DBEs listed on Form 25A325C as scheduled or fails to submit required documentation to verify proof of payment or documentation requested by the Department to help in the determination of CUF, the Department will consider this to be unsatisfactory work. If the Contractor fails to utilize Good Faith Efforts to replace a DBE, regardless of fault (except for Subsection 120-3.04 item 3), the Department will also consider this unsatisfactory work.

Unsatisfactory work may result in disqualification of the Contractor from future bidding under Subsection 102-1.13 and withholding of progress payments consistent with Subsection 109-1.06. (11/17/00)S 33

SECTION 202

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Special Provisions

202-3.05 REMOVAL OF PAVEMENT, SIDEWALKS, AND CURBS. Add the following: Obtain a solid waste disposal permit from DEC or use a site previously approved by DEC for disposal of removed asphalt if not using it in the embankment. A DEC permitting officer in Anchorage may be contacted at (907) 269-7590. (03/29/01)R84USC

202-4.01 METHOD OF MEASUREMENT. Add the following: Pavement removal will be considered a subsidiary contract requirement and will not be measured for payment.

SECTION 504

STEEL STRUCTURES

Special Provisions

CONSTRUCTION REQUIREMENTS

504-3.01 FABRICATION.

8. Welding. Delete item e and f in the second paragraph and substitute the following:

   e. Names and qualifications of the NDE technicians
   f. Type and extent of NDE to be conducted, as required in the specifications and as shown on the approved shop drawings.

SECTION 505

PILING

Special Provisions

505-3.03 PILE BEARING VALUES. Delete the first paragraph of this subsection and substitute the following: Drive all piles, except piles for cameras, overheight vehicle detection system (OVDS), and antennae structures to the required ultimate bearing capacity. For cameras, OVDS, and antennae structures, 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.

505-3.09 DRIVING PILES. Add the following: Sites for the cameras, OVDS, and antenna structure 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 camera, OVDS, and antenna structure foundation cannot be obtained, install the pile tip to an elevation established by the Engineer.

505-4.01 METHOD OF MEASUREMENT. Add the following to the second paragraph:

Do not measure piles for cameras, OVDS, and antenna structures for payment.

505-5.01 BASIS OF PAYMENT. Add the following to the second paragraph: Include costs of furnishing and installing piles for cameras, OVDS, and antennae structures in the appropriate Section 669 bid item.

(06/26/03)R65USC02

SECTION 606

GUARDRAIL

Special Provisions

606-1.01 DESCRIPTION. This work shall consist of furnishing, constructing and placing Fixed Steel Posts to conform to the Plans and Special Provisions.

606-2.01 MATERIALS. Add the following:

a. Concrete

Concrete shall Class W.

b. Posts

Posts shall be Schedule 40 steel pipe of the size specified in the Plans.

c. Guard Post Cover/Sleeve

Materials used for guard Post covers shall be molded from a durable polyethylene with ultra-violet (UV) stabilizers to ensure product life and color fastness.

The polyethylene guard Post cover or sleeve shall be color yellow and have two white/silver reflective stripes. The guard post cover or sleeve shall be:

1) Encore Commercial Products, Inc
24370 Northwestern Hwy. Suite 250
Southfield, MI 48075
1-866-737-8900 (toll free)
www.postguard.com

2) Robert Liles
2817 Roanoke Ln. Suite100
Tyler, TX 75701-6520
903-566-5499
www.robertliles.com

3) Street Smart Solutions
4701 Fiore Bella Blvd.
Las Vegas, NV 89135
1-866-880-4880 (toll free)
www.us-postman.com

or approved equal.

606-3.01 GENERAL. Add the following:

Posts shall be set plumb, level and true to line. Top of a row of bollards shall be maintained at a consistent level above adjacent ground.

Posts shall be embedded in concrete.

For Fixed Steel Posts, provide footing as shown on drawings. Slope drainage from post at two percent (2%) grade. Place concrete inside steel pipe for full extent. Rod concrete to remove air voids. Dome top to provide clean transition from top surface to Post sides. Do not leave exposed edge. Provide brushed finish to concrete dome.

Install guard Post cover or sleeve according to the manufacturer's recommendations.

606-4.01 METHOD OF MEASUREMENT. Add the following:

4. Fixed Steel Post. Measured by each unit installed and accepted. Excavation, backfill, concrete, steel pipe, guard post cover and incidental work required to complete work according to the Plans will not be measured for payment but will be subsidiary.

606-5.01 BASIS OF PAYMENT. Add the following:

Pay Item No.	Pay Item	Pay Unit
606(17)	Fixed Steel Post	Each

SECTION 615

STANDARD SIGNS

Special Provisions

615-2.01 MATERIALS. Under item 1. delete the first sentence and substitute the following: Unless Shop Drawings have been provided in the Contract, submit shop drawings for all special signs that are not shown in the Alaska Sign Design Specifications (ASDS and that require the use of the ASDS, the Department of Transportation and Public Facilities - Sign Face Fabrication Requirements, and the Alaska Traffic Manual, letter width and spacing charts for approval before fabrication. (11/06/02)R50USC02

Standard Modification

615-2.01 MATERIALS. Delete the first paragraph of Item 2. including subitems a., b., and c. and replace with:

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

   a. Orange Background Signs: Use either Type II or Type III orange reflective sheeting or use Type VII or Type IX fluorescent orange reflective sheeting. For temporary installations place reflective sheeting on sheet aluminum, plastic, or plywood panels.

   b. Railroad Crossbucks and Vertical Crossbuck Supports: Use white Type VIII or Type IX reflective sheeting for background of sign and strips.

   c. Non-Illuminated Overhead Signs with White Legends on Green Backgrounds: Use Type IX reflective sheeting for legends and background. Create the legend in one of the following ways:
      (1) Cut border and legend from white Type IX reflective sheeting and adhere to a green 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 Type IX reflective background.

   d. Fluorescent Yellow-Green School Area Signs: Use Type VIII or Type IX reflective sheeting for background.

Add the following paragraph:

Reflective Sheeting Warranty. Supply manufacturer's warranty for reflective sheeting, including retention of fluorescent yellow-green (measured according to ASTM E 2301) for ten years according to the following criteria:

Minimum Fluorescent Luminance Factor	Y_F: 20%
Minimum Total Luminance Factor	Y_T: 35%

The warranty shall stipulate that: If the sheeting fails to meet the minimum fluorescence values within the first 7 years from the date of fabrication, 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 the 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. E26(1/1/06)

Special Provisions

615-3.01 CONSTRUCTION REQUIREMENTS. Delete item 1 and substitute the following:

1. Install signpost foundations according to subsection 660-3.02.

Replace the sixth sentence in item 7 and substitute the following:

Deliver sign panels, posts and hardware to the State Maintenance Yard located in Anchorage.

Add the following:

15. Clear brush around existing signs to improve visibility.

615-3.02 SIGN PLACEMENT AND INSTALLATION. Add the following: Do not remove existing signs without authorization from the Engineer.

615-5.01 BASIS OF PAYMENT. Delete the first sentence and substitute the following: Sign posts, bases, mounting hardware, and concrete used for sign bases are subsidiary.

Add the following: No separate payment for keeping existing signs in service until they are no longer needed or temporary relocation of existing signs will be made. This work is subsidiary to Item 615(1) Standard Sign.

No separate payment for removal of existing sign post foundations or work required to abandon them in place will be made, but shall be subsidiary to Item 615(1) Standard Sign.

No separate payment for salvaging activities detailed in subsection 615-3.01 will be made. This work will be subsidiary to Item 615(1) Standard Sign.

Clearing brush around existing signs is subsidiary to 615 items.

(11/06/02)R50USC02

SECTION 619

SOIL STABILIZATION

Special Provisions

619-1.01 DESCRIPTION. Add the following: For disturbed slopes requiring topsoil and seed, place matting material on all 2:1 or steeper slopes that are higher than 3 feet.

619-4.01 METHOD OF MEASUREMENT. Add the following: Matting will not be measured for payment.

661-5.01 BASIS OF PAYMENT. Add the following: Payment for matting is subsidiary to other work items.

SECTION 641

EROSION, SEDIMENT, AND POLLUTION CONTROL

Special Provisions

641-1.02 DEFINITIONS. Item 1. add the following to the end of the last sentence:
BMP: Add " , most recent revisions."
Item 2 Note which appendix ESCP is in.
Item 5. after "EPA Form 3510-9 add the following: ", most recent revisions." Add the following: "eNOI. Electronic notice of intent to begin ground disturbing activities under the NPDES General Permit."
Item 6 Change EPA Form number to 3510-13.

Replace subsection 641-1.03 with the following:

641-1.03 SUBMITTALS. For projects that disturb one acre or more of ground submit three copies each of the SWPPP and HMCP to the Engineer for approval. Submit one copy of the SPCC Plan (if required under subsection 641-2.03) to the Engineer. Sign submittals. Deliver these documents to the Engineer no less than five calendar days before the preconstruction conference.

The Department will review the SWPPP and HMCP submittals within 14 calendar days. Submittals will be returned to the Contractor as either requiring modification or having been approved by the Department. Besides a copy of the Contractor's NOI, the approved SWPPP must contain a certification and be signed by an authorized representative according to the Standard Permit Conditions of the NPDES General Permit Part 8, Appendix G. The Contractor must receive written notification from the Department that the SWPPP has been approved before the Contractor submits the Contractor's original NOI to EPA. NOIs can be submitted by Certified Mail or through the EPA's electronic NOI system (eNOI).

For regular U.S. Mail delivery:
EPA Storm Water Notice Processing Center
Mail Code 4203 M
U.S. EPA, 1200 Pennsylvania Avenue, NW
Washington, D.C. 2046064

For Overnight/Express Mail delivery:
EPA Storm Water Notice Processing Center
Room 7420, U.S. EPA
1201 Constitutional Avenue, NW
Washington, D.C. 20004

For electronic mail:
The Contractor must register on line with EPA at:
http://cfpub.epa.gov/npdes/stormwater/enoi.cfm.
This website has instructions and guidance on how to set up and use the eNOI system."

The Contractor shall not begin ground disturbing activities until the Engineer has issued the Contractor a written statement that the EPA has listed the Contractor's NOI and the Department's NOI as active.

The Department will submit the approved SWPPP to ADEC that will include both the Contractor's and Department's NOIs. The Department will transmit the Department's NOI to the EPA."

The active status NOIs, approved SWPPP, approved HMCP, and submitted SPCC Plan (when required) become the basis of the work required for the project's erosion, sediment, and pollution control.

When the Department has determined the site has achieved final stabilization, the Engineer will provide written notification to the Contractor that the Contractor's NOT may be submitted to EPA with a copy to the Engineer. The Department will transmit the Department's NOT to the EPA.

When the Contractor receives written notice from the Department that the project is stabilized, submit signed NOT to EPA with a copy to the Engineer. The Department will transmit the Department's NOT to the EPA.

641-2.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS: Add following to the end of the third sentence: "most recent revisions."

Replace subsection 641-3.01 with the following:

641-3.01 CONSTRUCTION REQUIREMENTS.

Postings.

Do not begin ground disturbing work until receiving written notification from the Engineer that the EPA has acknowledged receipt of the Contractor's NOI and the department's NOI, and has listed them as active status. The EPA will post the status of the NOIs on the EPA website.

Post at the construction site:
1. NPDES Permit number, if available, and a copy of the NOI,
2. Name and phone number of the local contact person, and
3. Location of a SWPPP available for viewing by the public.

Comply with requirements of the approved HMCP, the submitted SPCC Plan, and state and federal regulations that pertain to the handling, storage, cleanup, and disposal of petroleum products or other hazardous substances. Contain, clean up, and dispose of discharges of petroleum products and/or other materials hazardous to the land, air, water, and organic life forms. Perform all fueling operations in a safe and environmentally responsible manner. Comply with the requirements of 18 AAC 75 and AS 46, Oil and Hazardous Substances Pollution Control. Report oil spills as required by federal, state and local law, and as described in the SPCC Plan.

Comply with requirements of the NPDES General Permit, implement temporary and permanent erosion and sediment control measures identified in the SWPPP, and ensure that the SWPPP remains current. Maintain temporary and permanent erosion and sediment control measures in effective operating condition.

Inspections

Perform inspections and prepare inspection reports in compliance with the project SWPPP and the NPDES General Permit.

1. Joint Inspections. Before start of construction, conduct a joint on site inspection with the Engineer and the Contractor's field representative to discuss the implementation of the SWPPP.

   Conduct the following additional joint on site inspections with the Engineer:

   a. During construction, inspect the following at least once every seven days and within 24 hours of the end of a storm exceeding 1/2 inch in 24 hours (as recorded at or near the project site):
      (1) Disturbed areas that have not been finally stabilized.
      (2) Areas used for storage of erodible materials that are exposed to precipitation.
      (3) Sediment and erosion control measures.
      (4) Locations where vehicles enter or exit the site.

   b. Before winter shutdown, to ensure that the site has been adequately stabilized and devices are functional.

   c. At project completion, to ensure final stabilization of the project.

2. Winter Inspections. During winter shutdown, conduct inspections at least once every month and within 24 hours of a storm resulting in rainfall of 1/2 inch or greater. The Engineer may waive monthly inspection requirements until one month before thawing conditions are expected to result in a discharge, if all of the following requirements are met:
   a. Below freezing conditions are anticipated to continue for more than one month.
   b. Land disturbance activities have been suspended.

c. The beginning and ending dates of the waiver period are documented in the SWPPP.

3. Inspection Reports. Prepare and submit, within three working days of each inspection, a report on state Form 25D-100, with the following information:
   a. A summary of the scope of the inspection.
   b. Name(s) of personnel making the inspection.
   c. The date of the inspection.
   d. Observations relating to the implementation of the SWPPP.
   e. Any actions taken as the result of the inspection.
   f. Incidents of noncompliance.

   Where a report does not identify any incidents of noncompliance, certify that the facility complies with the SWPPP and NPDES General Permit. The Contractor and the Engineer will sign the report according to the Standard Permit Conditions of the NPDES General Permit, Part 8, Appendix G. Include reports as an appendix to the SWPPP.

   Retain copies of the SWPPP and other records required by the NPDES General Permit, for at least three years from the date of final stabilization.

If unanticipated or emergency conditions threaten water quality, take immediate suitable action to preclude erosion and pollution.

Amendments

Submit amendments to the SWPPP to correct problems identified because of:
1. Storm or other circumstance that threatens water quality, and
2. Inspection that identifies existing or potential problems.

Submit SWPPP amendments to the Engineer within seven days following the storm or inspection. Detail additional emergency measures required and taken, to include additional or modified measures. If modifications to existing measures are necessary, complete implementation within seven days.

Stabilize areas disturbed after the seeding deadline within seven days of the temporary or permanent cessation of ground disturbing activities.

Notice of Termination

Submit a signed NOT to EPA and a copy to the Engineer:

1. Upon receipt of written notification from the Engineer the project site (including material sources, disposal sites) has been finally stabilized and storm water discharges from construction activities authorized by this permit have ceased, or

2. When the construction activity operator (as defined in the NPDES General Permit) has changed and the Engineer provides written notification that the Contractor's responsibilities with respect to compliance with the NPDES GP on the project have ceased.

Penalties

If the Contractor fails to coordinate temporary or permanent stabilization measures with the earthwork operations in a manner to effectively control erosion and prevent water pollution, the Engineer may suspend earthwork operations and withhold monies due on current estimates for such earthwork items until all aspects of the work are coordinated in a satisfactory manner.

If the Contractor fails to:

1. Pursue work required by the approved SWPPP,
2. Respond to inspection recommendations and/or deficiencies in the SWPPP, or
3. Implement erosion and sedimentation controls identified by the Engineer, the Engineer may, after giving written notice, proceed to perform such work and deduct the cost thereof, including project engineering costs, from progress payments.

641-5.01 BASIS OF PAYMENT. Replace the first sentence with the following: Use only Items 641(1), (3), and (4).

R272USC04(10/27/05)

SECTION 643

TRAFFIC MAINTENANCE

Special Provisions

643-1.03 TRAFFIC CONTROL PLAN. Replace the last paragraph with the following: A waiver may be requested of regulation 17 AAC 25 regarding oversize and overweight vehicle movements within this project in writing. If the waiver is approved, movements of oversize and overweight vehicles in or near traffic within the project limits will be done according to the provisions of an approved Traffic Control Plan. Maintain a minimum12 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.

643-2.01 MATERIALS. Add the following:

17. Flexible Markers. Refer to subsection 606-2.01 Materials.

Standard Modifications

Under Item 16. Flagger Paddles, replace the last sentence with the following: Use reflective sheeting that meets AASHTO M 268 Type VIII or IX. Use background colors of fluorescent orange on one side and red on the other side. E29(3/15/06)

643-3.01 GENERAL CONSTRUCTION REQUIREMENTS. Add the following: Immediately notify the Engineer of a traffic related accident that occurs within the project limits as soon as becoming aware of the accident. (03/15/06)E29

Special Provisions

643-3.01 GENERAL CONSTRUCTION REQUIREMENTS. Add the following: Whenever construction activity encroaches onto the safe route in a traffic control zone, station a flagger at the encroachment to assist pedestrians and bicyclists past the construction activity.

Maintain business accesses during flagging operations.

643-3.02 ROADWAY CHARACTERISTICS DURING CONSTRUCTION. Add the following: Traffic may be maintained on a continuous gravel surface for 1,000 feet.

Pave lanes next to the median first. Pave lanes next to exit and entrance ramps last. Place a 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.

Standard Modification

643-3.04 TRAFFIC CONTROL DEVICES. In the sixth paragraph and also in Item 4.b., delete: "ATTSA" and replace with: ATSSA (American Traffic Safety Services Association). E29(3/15/06)

Special Provisions

643-3.04 TRAFFIC CONTROL DEVICES.

Delete the first sentence of the eighth paragraph and substitute the following: Items paid under this Section remain the Contractor's property unless stated otherwise.

Add the following to item 1. Embankments.: Close trenches and excavations at the end of each continuous work shift.

Add the following to item 3. Fixed Objects.: Remove obstructions greater than 4 inches above the nominal foreslope grade at the end of each continuous work shift.

Delete item 4.b. and replace with the following: Flagger Certification by ATSSA

Delete item 6 and replace with the following:

6. Street Sweeping. 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 using a street sweeper that can collect materials rather than eject them to the shoulder of the road.

7. 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 using a power broom that can eject them to the shoulder of the road.

Change items 7 and 8 to 8 and 9 respectively.

Add the following:

10. ET-2000 LET. The price listed in the Traffic Control Rate Schedule will be full compensation for the purchase, installation, maintenance during construction, removal and salvaging the ET-2000 LET unit(s). Deliver the

salvaged unit(s) to the nearest DOT &PF Maintenance and Operations' district office, or as directed by the Engineer.

643-3.05 AUTHORITY OF THE ENGINEER. Replace the first sentence with the following: When existing conditions adversely affect the public's safety or convenience, the Contractor will receive an oral notice. A written notice will follow the oral notice according to subsection 105-1.01 Authority of the Engineer.

Add the following after the second sentence: In no case shall this time exceed 24 hours.

643-3.06 TRAFFIC PRICE ADJUSTMENT. Add the following: 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 643-1, for the time the roadway or pedestrian facility is in an unacceptable condition.

Delete Table 643-1 and substitute the following:

TABLE 643-1
ADJUSTMENT RATES

Published ADT	Dollars/Minute of Delay/Lane
0-5,000	$30
5,001+	$40

643-3.08 CONSTRUCTION SEQUENCING. Delete the last sentence and substitute the following: 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 from 0600 hours to 0830 hours and 1400 hours to 1830 hours.

2. Friday from 1200 hours to Sunday 2300 hours

3. Around any holiday:

   a. If a holiday falls on Sunday, Monday or Tuesday, the above stipulations apply from 1200 on the Friday before the holiday to 0300 on the day after the holiday.

   b. If a holiday falls on Wednesday, the above stipulations apply from 1200 on the Tuesday before the holiday to 0300 on the Thursday after the holiday.

c. If a holiday falls on Thursday, Friday or Saturday, the above stipulations apply from 1200 on the day before the holiday to 0300 on the Monday after the holiday.

4. During the Alaska State Fair.

Lane restrictions, if allowed shall be conducted so that no more than a 10 minute accumulated stopped delay, 40 vehicles, or 1/4 mile (1,320 feet) of traffic is detained, whichever occurs first, before releasing the detained motorists. During paving operations a 20 minute stopped delay, 80 vehicles, or 1/2 mile (2,640 feet) of traffic detained, will be allowed for motorists except school buses. If a queue of traffic develops at a stop, the entire queue must be emptied to include the last car that entered the queue at the time the queue was released.

Obtain the local school bus schedule and coordinate work efforts to ensure the school buses are not delayed through the construction zone. This plan shall be submitted, as a TCP, to the Engineer for approval before the implementation of the school bus coordination plan.

643-3.09 INTERIM PAVEMENT MARKINGS. In the second paragraph, delete the words "or cover them with black removable preformed marking tape."

Replace the first sentence in the last paragraph with the following: Apply final pavement markings according to subsection 670-3.01, Construction Requirements of these Special Provisions.

Standard Modification

Add the following new subsection:

643-3.11. HIGH VISIBILITY CLOTHING. Ensure workers within project limits wear an outer visible surface or layer that complies with the following requirements:

1. Tops.

   Wear fluorescent vests, jackets, or coverall tops at all times. Furnish each vest, jacket, or coverall top with at least one 360 degree horizontal retroreflective band around the torso; and two vertical retroreflective bands that begin at the horizontal band or lower in front, reach over the shoulder, and end at the horizontal band or lower in back. Furnish each jacket and coverall top with two horizontal retroreflective bands on each sleeve; one above and one below the elbow.

2. Bottoms.

Wear fluorescent red-orange pants or coverall bottoms during nighttime work (sunset to sunrise). Worksite traffic supervisors, employees assigned to traffic control duties, and flaggers wear fluorescent orange-red pants or coverall bottoms at all times. Furnish each pants or coverall bottom with two horizontal retroreflective bands on each leg.

3. Raingear.

Raingear tops and bottoms, when worn as the outer visible surface or layer, shall conform to the requirements listed in this subsection 643-3.11.

4. Exceptions.

When workers are inside an enclosed compartment of a vehicle, they are not required to wear high visibility clothing.

5. Standard.

High visibility garments shall conform to the requirements of ANSI/ISEA 107-2004, Class 2 for tops or Class E for bottoms, and Level 2 retroreflective material.

Retroreflective bands are made of material conforming to either:

a. A 2 inch wide strip, fluorescent yellow-green color, made of retroreflective microprisms; or

b. A 2 inch wide strip, silver color, made of retroreflective lenses bonded to a durable cloth backing; and on 2 long edges apply 1 inch wide strips, fluorescent yellow-green color, made of durable cloth material. Total width of band is 4 inch.

6. Labeling.

Garments shall be labeled according to Section 10.2 of ANSI/ISEA-107-2004; except garments may be labeled to conform to ANSI/ISEA 107-1999 until 1/1/08.

7. Condition.

Furnish and maintain vests, jackets, coveralls, rain gear, hard hats, and other apparel in a neat, clean, and presentable condition. Maintain retroreflective material to Level 2 standards. (1/01/06)E28

Special Provisions

643-4.01 METHOD OF MEASUREMENT.

Replace the second sentence of Item 2 with the following: Special Construction Signs are measured by the total area of legend bearing sign panel, as determined under subsection 615-4.01 and compensation for a 24 hour period shall be made under Construction Signs in the Traffic Control Rate Schedule.

Add the following: 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 Item 643(1) or 643(2), Traffic Maintenance.

643-5.01 BASIS OF PAYMENT. Add the following: The Engineer does not require a change order/directive for Item 643(25) Traffic Control.

TRAFFIC CONTROL RATE SCHEDULE

Traffic Control Device	Pay Unit	Unit Rate
Construction Signs	Each/Day	$5.00
Special Construction Sign	Square Foot	$20.00
Type II Barricade	Each/Day	$ 3.00
Type III Barricade	Each/Day	$ 10.00
Traffic Cone or Tubular Marker	Each/Day	$ 1.00
Drums	Each/Day	$ 3.00
Sequential Arrow Panel	Each/Day	$55.00
Portable Concrete Barrier	Each	$60.00
Temporary Crash Cushion / ET-2000 LET	Each	$3,000.00
Pilot Car	Hour	$65.00
Watering	M-Gallon	$ 20.00
Street Sweeping	Hour	$150.00
Power Broom	Hour	$75.00
Plastic Safety Fence	Foot	$.75
Portable Changeable Message Board Sign	Calendar Day	$150.00
Temporary Sidewalk Surfacing	Square Foot	$1.15
Flexible Markers	Each	$50.00
Removal of Pavement Markings	Foot	$1.25
Temporary Guardrail	Foot	$21.00

The Engineer will pay for Item 643(15) Flagging on a contingent sum basis at the rate of $38/hour. The Engineer does not require a change order/directive for the flagging pay item. Flagging associated with Change Order work will be paid at the prices according to subsection 109-1.05 Compensation for Extra Work. (01/04/06)R222USC04

Standard Modification

Add the following: Payment for high visibility clothing for workers is subsidiary to other items. (3/15/06)E29

Special Provisions

Delete Item 643(15) and substitute the following:

Pay Item No.	Pay Item	Pay Unit
643(15)	Flagging	Contingent Sum

(02/10/06)R222USC04

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 fourteen (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 item 2. 60-Day Preliminary Schedule.

Delete the first sentence of item 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. (12/13/02)R261M98

SECTION 660

SIGNALS AND LIGHTING

Special Provisions

660-1.01 DESCRIPTION. Add the following: Work under this section shall also include Commercial Vehicle Information Systems and Networks (CVISN)- Automatic Vehicle Identification (AVI), Remote Video Monitoring Camera Systems, Over-Height Vehicle Detection and Warning System (OVDS), and Backup Detection Systems. See Section 669 for additional requirements.

All references to signals and lighting, as applicable, shall also apply to Commercial Vehicle Information Systems and Networks (CVISN)- Automatic Vehicle Identification (AVI), Remote Video Monitoring Camera Systems, Over-Height Vehicle Detection and Warning System (OVDS), and Backup Detection Systems.

660-2.01 MATERIALS. Delete the requirement for "Steel Pipe Pile" and substitute the following:

Steel Pipe Pile	Grade X42 steel pipe conforming to API 5L

1. Equipment List(s) and Drawings. Delete item a in its entirety and the last sentence in item d and substitute the following:

   a. Materials on the *Approved Products List*: The Approved Products List does not apply to the 660 items. Provide catalog cuts of materials to the Engineer for review and approval.
   d. Materials Not Requiring Certification: Only submit these materials for review and approval if they are included on the Materials Certification List (MCL).

2. As-Built Plans. Add the following:

   The Engineer will deliver one copy each to State Maintenance and Operations; Technical Services; and attach the appropriate sheets of the last set in clear plastic envelopes to the inside of each controller assembly and load center.

CONSTRUCTION REQUIREMENTS

660-3.01 GENERAL. Delete items 3 through 8 in their entirety and substitute the following:

3. Excavating and Backfilling. Complete excavation and backfill required to install the signal and lighting components embedded in the roadway as

shown in the Plans, including foundations, conduits, junction boxes, and loop detectors. 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 encountered during excavation.

Excavate trenches wide enough to install the number of conduits specified side by side, to provide clearances of at least 2½ -inches around two-inch conduits and at least two-inches around conduits larger than two-inches, and to compact the bedding and backfill materials according to these specifications.

To install conduits, excavate trenches deep enough to allow for six 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.

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.

Dewater excavations immediately before and during embedding and backfilling operations. Backfill excavations with materials that meet the following requirements

a. Around formed foundations and the tops of pipe pile foundations, use material that meets the requirements of Selected Material, Type A that passes through a 3 inch sieve,
b. Within the limits of the typical section, embed conduits and backfill trenches using material that meets the requirements of the lift in which it is located, reusing excavated materials if it meets the requirements of the applicable lift,
c. In other locations, embed conduits and backfill trenches using material that meets the requirements of Selected Material, Type C, reusing excavated materials if it meets this requirement.
d. Import, when ordered, embedment and backfill materials that satisfy the preceding materials requirements.

Embed conduit(s) between two six inch lifts of material gleaned free of rocks exceeding a one-inch maximum dimension. Grade and compact the first lift to provide a surface that continuously contacts the assembled conduit run.

Within six feet of paved surfaces and around foundations, backfill in uniform layers no more than six-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, which 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 nonreusable improvements removed to complete the work, the repairs of which are not covered by other items in the contract.
   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, that do not conflict with the work and are 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 they were installed. The contractor may not reuse crushed aggregate base material 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 clean and serviceable condition with the approval of the Engineer. In completing the reconstruction work, match the alignments, widths, thickness, 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 four 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 nearest District Maintenance Station or place specified in the Plans or Special Provisions. Notify the district superintendent or person specified by telephone one-week before the 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. Replace, at the contractor's expense, all 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 them as directed.

With approval, after removing conductors, conduits may be abandoned that do not interfere with other construction with a credit taken by the

Department. 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, which 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.

When ordered, the Engineer will pay for repairing damaged finishes on existing equipment according to subsection 660-3.01.8 as extra work.

If new equipment is used rather than reusing the equipment specified, notify the Engineer of the change and include a submittal according to subsection 660-2.01.1.

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 the 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 the tests on the repaired circuit and continue this process until the circuits have passed the 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 multi-pair 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 volts DC, 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 multi-conductor cable, complete the test between conductors and between each conductor and ground.

After splicing the loops to 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 Friday, Saturday, Sunday, a legal holiday, or the day before the legal holiday.

Before each system turn-on, aim signal faces according to subsection 660-3.08 and ensure all 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 a 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 pre-treatment, 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 non-galvanized 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.

Add the following new item 9:

9. Regulations 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.

660-3.02 FOUNDATIONS. Under item 1. Cast-in-Place Foundations., add the following to the first paragraph: Locate the tops of traffic signal post and pole foundations flush with the adjacent finished: walkway, shoulder, or surrounding ground.

1. Cast-in-Place Foundations. In subparagraph f, revise the second sentence to read: Before placing the form or reinforcing steel cage, remove loose material from the bottom of the hole to ensure the foundation rests on firm, undisturbed ground.

In the second sentence of sub-item i delete "prior to grouting." and substitute "before attaching the skirt."

In the first sentence of sub-item j, delete "concrete pile caps" and substitute "foundations"

Delete item k and add the following new items k and l:

k. Install the bottoms of the bottom leveling nuts in a level plane within one-inch of the top of foundations. Generously lubricate the bearing surface and internal threads of top nuts with beeswax and tighten the top nuts according to the anchor bolt tightening procedure included in the subsection 660-3.08.5 High Tower Lighting System Installation.

l. Attach a 4 AWG, bare, solid copper wire as a grounding electrode conductor to the #4 spiral bar in the reinforcing steel cage. Use an irreversible compression connector or cadweld 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, solid copper wire as the grounding electrode. Route the conductor to protrude near the top, center of the foundations. Slide a minimum six-inch long, non-metallic, protective sleeve over the conductor. Allow one-inch of the sleeve and 24-inches of conductor to protrude from the foundations.

2. Pile Foundations. Add the following new item g:

g. Use no more than one splice per foundation. Locate the splice at least seven feet from the top of pile.

Replace subsection 660-3.03 with the following:

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. 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.

5. 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.

6. 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 two self-clinching nylon cable ties.

7. Keep conduits clean. Install grounding bushings and approved plastic insert type plugs on the ends of conduit runs before backfilling around the conduit ends.

8. 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.

9. 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.

10. Position conduits in trenches, junction boxes, and foundations to provide clearances of at least 2½ -inches around two-inch conduits and at least 2-inches around conduits larger than 2-inches.

11. 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.

12. Coat drilled holes, shop and field cut threads, and the areas with damaged zinc coating with zinc rich paint.

13. When standard couplings cannot be used to join conduit components, use approved threaded unions.

14. Bury a continuous strip of 4 mils thick, six-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.

15. If obstructions are encountered 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 1-¼ to 1 slope (a horizontal to vertical ratio) from the edge of pavement. Do not leave these pits unattended until an approved means of protection has been installed.

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 all future use or spare conduits, and reinstall the plugs. Double back at least two feet of pull rope into both ends of each conduit.

21. Conduits larger than the sizes specified may be installed. 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 specified to be removed or replaced as follows:

- When the conduits contain cables that will remain in service, leave the cables in place during the cleaning, and
- 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 90 degrees of 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.

Replace subsection 660-3.04 with the following:

660-3.04 JUNCTION BOXES. Install pre-cast 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.

When shown, install junction boxes at the station and offset locations specified. When lateral locations are not specified, install junction boxes eight feet from the face of curb or edge of pavement. If the eight feet offset falls

1. In a pedestrian facility separated less than seven 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 them at locations as directed, avoiding curb ramps, curb ramp landings, and the middle of walkways.
2. In a pedestrian facility separated at least seven 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 five 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 ten 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.

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 contain two loop lead-in cables or a single cable other than signal interconnect.
3. 190 feet for conduits that contain more cables than those listed in the two preceding limitations.
4. If the three preceding limitations require installing additional junction boxes not shown on the Plans, those junction boxes will be paid for 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 one-inch below finished grade. In seeded areas, install the tops of junction boxes to two-inches below the seeded surface.

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 coarse aggregate for concrete that conforms to subsection 703-2.02. Minimum drain dimensions include an 18" depth and a length and width equal to those of the junction box it drains. Compact the aggregate material as directed to prevent junction box settlement.

In every new and reused junction box, install an electronic marker that consists of an antenna encapsulated in a 4-inch diameter red polyethylene ball. Furnish markers that conform to the American Public Works Association standards for locating power. Markers shall respond to locator devices up to 5-feet away, work at all temperatures, and contain no internal power source.

660-3.05 WIRING. Delete the second paragraph in its entirety and substitute the

following:

Do not pull conductors into conduits until the following conditions are met:

a. The prescribed clearances around conduit ends are provided,
b. Crushed rock sumps are installed under junction boxes,
c. Conduit ends protrude above the bottom of junction boxes within the prescribed range,
d. New conduits are free of materials that became lodged in them during the completion of the work,
e. Reused conduits are cleaned according to subsection 660-3.03,
f. Junction boxes are set to grade, and
g. Grounding bushings are installed on the ends of metallic conduits.

Delete item 3 in its entirety and substitute the following:

3. Pull, as a unit, the conductors specified to be installed into clean conduits, leaving existing conductors that will remain in service in place.

Add the following line to Table 660-1 under subitem a. of item 9.

LOOP DETECTOR NUMBER	COLORED PAIR
Usually a spare pair	Orange and Black

Delete items 11 and 12 in their entirety and substitute the following:

11. Encapsulate illumination cable splices in rigid 2-piece plastic molds filled with an insulating and sealing epoxy resin. Furnish molds large enough to complete the splices and encase the cable jackets in the epoxy resin. Furnish molds rated for 600 volts AC operation and 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.

12. Encapsulate loop lead-in and telemetry cable splices in rigid, transparent, PVC molds filled with re-enterable polyurethane electrical insulating and sealing compound. Furnish splice kits rated for 1000 volts AC operation and direct burial.

    Provide re-useable 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 have fill and vent funnels.

    Insert a loose woven polyester web that allows a full ¼-inch of insulating compound to flow between the splice and the inside of the mold. Fill the PVC molds with re-enterable polyurethane electrical insulating and sealing

compound that cures transparent, is nontoxic, is non-corrosive to copper, and does not support fungi or mold growth.

Add the following items:

18. Retrofit reused poles with new tap wires, fused disconnect kits, and fuses.

19. Whenever the conductors cannot be terminated as specified in the Plans in circuit breakers due to size, splice a piece of #8 AWG 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 conductor to 5 feet.

Replace subsection 660-3.06 with the following:

660-3.06 BONDING AND GROUNDING. Bond and ground branch circuits according to the NEC and the following requirements. Make non-current carrying but electrically conductive components, including: metal conduits, junction box lids, cabinets, transformer cases, and metal posts and poles, mechanically and electrically secure to an equipment grounding conductor. Make fixtures mounted on metal poles, including signal components and luminaires, mechanically and electrically secure to the pole.

Install grounding bushings with insulated throats on the ends of metallic conduits.

Install a bare stranded copper wire for the equipment-grounding conductor in conduits, except those conduits installed for future use. Install size 8 AWG 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 installing or removing conductors from existing conduits, retrofit them with new grounding conductors sized according to the preceding paragraph.

Bond junction box lids to the grounding conductor using copper braid with a cross-sectional area equal to an 8 AWG conductor. 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 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 four feet long grounding conductor from the grounding bushing on the conduit to the grounding lug located in the hand hole 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 hand hole of each pole.

Ground one side of the secondary circuit of a transformer.

Install a ¾ 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.

660-5.01 BASIS OF PAYMENT. Add the following: Labor, equipment, tools, and materials necessary to sawcut, remove and replace asphalt or concrete pavement required to install piezoelectric and inductive traffic loops in existing pavement are subsidiary.

Labor, equipment, tools, and materials necessary to remove and replace improvements required to install the proposed improvements are subsidiary.

The costs of repairing damage to finishes on new equipment are a subsidiary obligation.

SECTION 661

ELECTRICAL LOAD CENTERS

Special Provisions

661-2.01 MATERIALS. Under Transformers., add the following: Transformers must be provided with a minimum of two 2.5% primary taps below rated voltage. Voltage shall be measured at the point of use with complete systems in operation, and tap settings shall be adjusted to provide the voltage at the point of use nearest to, but not exceeding, the rated voltage of the equipment.

661-4.01 METHOD OF MEASUREMENT. Add the following: Removal of existing transformers will not be measured for payment.

661-5.01 BASIS OF PAYMENT. Add the following: Removal of existing transformers is subsidiary to other items of work.

Payment for modifying existing load centers and load panels is subsidiary to Items 669 (1A) through 669 (1D).

Add the following Section:

SECTION 663

MULTIMODE FIBER OPTIC CABLE PLANT

Special Provisions

663 1.01 DESCRIPTION. This item consists of the work required to furnish and install multimode fiber optic cable in polyethylene conduit between equipment shown on the Plans along the route indicated. The item includes installing vaults, splicing cable, testing cable, and terminating fibers.

663-1.02 REFERENCED SPECIFICATIONS. Complete the following work according to the subsections referenced.

1. Submit materials for review and approval, prepare as-built plans, and deliver warranties, guarantees, and instruction sheets according to subsection 660-2.01 Materials.

   The fiber optic cable manufacturer shall submit a letter certifying products conform to requirements specified herein.

2. Complete excavation and backfill according to subsection 660-3.01.3 Excavating and Backfilling, except install conduits at the depth specified in the Polyethylene Duct System Construction Requirements.

3. Remove and replace improvements according to the subsection 660-3.01.5 Removing and Replacing Improvements. .

663-1.03 CERTIFIED FIBER OPTIC TECHNICIAN. Employ a Fiber Optic Technician that has successfully completed at least one four day "Installation of Fiber Optic Products School." A major manufacturer of fiber optic products shall conduct this school or an Engineer approved independent generic four-day school that encompasses aspects of fiber optic technician certification.

Only employ those technicians that provide documents proving a minimum two years work experience splicing, terminating, and testing fiber optic cable.

The approved technician shall provide evidence of completed courses within 1 week before the beginning of construction. The Engineer reserves the right to revoke the approval of technicians not demonstrating the skill and knowledge to perform at accepted industry standards or to the quality required in this special provision.

663-1.04 MANUFACTURER WARRANTIES. Manufacturer's support (customary warranties) period shall be provided for all equipment and materials furnished and installed as part of the fiber optic system, including end equipment

(modems, panels, switches etc.). Manufacturer's and Contractor's warranties or guarantees shall be continuous throughout the specified duration; warranties and guarantees are subject to transfer.

663 2.01 POLYETHYLENE DUCT SYSTEM. Install polyethylene conduits and vaults in excavated trenches to form the duct system for the fiber optic cable. The Department will not permit the polyethylene conduits to be plowed into place.

For the polyethylene conduit, furnish a smooth wall, schedule 40 or schedule 80 as shown on the Plans, high-density polyethylene (HDPE) pipe that conforms to UL 651 B and features a controlled outside diameter.

663-2.02 FIBER OPTIC CABLE, GENERAL.

A current ISO9001 certified manufacturer, who is regularly engaged in the production of fiber optic cable according to these specifications, shall produce the fiber optic cable installed on this project. The manufacturer shall not only manufacture the fiber optic cables, but they shall also test and prepare the cables for shipping and provide connectors needed to complete the project.

Conformance Requirement References

Install fiber optic cable approved for use in underground ducts and which conform to:

1. United States Department of Agriculture Rural Utilities Service (RUS) standard 7 CFR 1755.900.

2. Department of Agriculture Rural Electrification Administration (REA) Bulletin 1753f-601 (PE-90) dated August 4, 1994, and these specifications.

3. National Electrical Code (NEC) Article 770; NFPA-National Fire Protection Agency.

4. Telecommunications Industry Association/ Electronic Industries Association (TIA/EIA) FOTP-Fiber Optic Test Procedures.

5. ASTM A615, Grade 60.

6. Bellcore Testing Requirements GR-771-CORE.

7. EIA/TIA-455-82B: Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable (ANSI/EIA/TIA-455-82B-92; Standard Test Procedures for Fiber Optic Fibers.

8. NEC 250-1: National Electric Code Grounding.; Article 770 Optical Fibers and Raceways.

9. Telcordia GR20-CORE: Optical Fiber and Optical Fiber Cable; GR409-Mechanical Requirements for Optical Fiber Cable.

10. Telcordia GR-771: Fiber Optic Splice Enclosure.

11. TIA/EIA-4720000-A: General Specification for Fiber Optic Cable (ANSI/TIA/EIA-4720000-A-93).

12. TIA/EIA-598-A: Optical Fiber Cable Color Coding (ANSI/TIA/EIA-598-A-95).

Use loose tube fiber optic cables with all-dielectric construction (with no metal armor or conductive material). Optical fibers shall be contained in kink resistant buffer tubes. Each cable shall be equipped with 12 buffer tubes stranded around an anti-buckling central strength member using a reverse oscillation or "SZ" stranding process.

Each buffer tube shall contain 6 fibers and shall have an inside diameter much larger than the total diameter of the fiber it supports. Buffer tubes may have up to 12 fibers where specified in the plan.

Fillers are allowed in the cable to achieve cable cross-section symmetry.

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.

Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding.

Fibers shall contain no factory splices.

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.

Repairs to the fiber coatings are not allowed except as determined by the Engineer at designated splice locations.

A water-blocking gel shall displace the voids between the buffer tubes and void areas around the individual buffer tubes to prevent water entry. The gel shall be non-nutritive, electrically non-conductive and homogeneous and shall facilitate free movement of the fibers within the tubes such that mechanically or environmentally induced stress on the cable is not induced in the optical fibers. The gel shall be free

of dirt or foreign matter and shall be readily removable with nontoxic solvents.

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.

Use cables that gain tensile strength by using a combination of high tensile strength yarns helically wrapped around the buffer tubes before the application of the outer jacket (sheath). The fiber optic cable shall withstand a maximum pulling tension of 600 lbs during installation (short term loading) with no damage and 200 lbs (long term loading).

Cable Color Coding

Furnish cables that use the TIA/EIA-598-B, "Optical Fiber Cable Color Coding" to distinguish individual buffer tubes and optical fibers. During temperature cycling, the coloring compounds shall not fade or smear onto each other or into the gel filling material, and not cause fibers to stick together. The color-coding is as follows:

1. Blue	5. Slate	9. Yellow
2. Orange	6. White	10. Violet
3. Green	7. Red	11. Rose
4. Brown	8. Black	12. Aqua

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.

Cable Outer Jacket

Furnish cables with the outer jacket applied directly over the high tensile strength yarns. The jacket shall be free of holes, splits, or blisters. The minimum nominal jacket thickness shall be 55 mils.

The outer jacket material shall be a medium density polyethylene (MDPE) conforming to ASTM D 1248, Type II, Class C, Category 4 or 5, Grade J4 and contain carbon black to provide ultra-violet light protection. The jacket material shall be fungus inert as described in ASTM G 21.

The cable shall contain at least one ripcord under the jacket for easy jacket removal.

Miscellaneous Requirements

The shipping, storage and operating temperature range of the cable shall be –40° F to +160° F.

In each vault, provide the additional length of cable listed in subsection, Construction Requirements for Communications Vaults.

Cable Identification

Cable markings shall be approximately 1/8-inch (3 mm) nominal height, clearly legible and distinguishable, and made at 2-foot intervals to be used as length markers. If initial markings fail to meet marking criteria, i.e. illegible, incorrect spacing, spelling error, etc., cables may be remarked to meet criteria. Cable markings shall include:

1. Cable ID
2. Sequential numbers in whole foot or meter intervals to determine the length of the cable and amount remaining on the reel.
3. Number of fibers
4. "MM" (for Multimode Fiber)
5. "ADOT Fiber"

Fiber Optic Drop Cable

Drop Cable is defined as the assembly or pigtail consisting of fiber optic cable, connectors, protective tubing and fan-outs (if required) and all incidental materials used for connectivity between a fiber trunk cable and field devices, i.e. signal controller, modems, etc.

Cable design and installation shall meet requirements for outdoor use as described in subsection, Fiber Optic Cable-General.

Optical jackets (3mm), where used, shall be orange for multimode fibers.

No splices are allowed within the cable length.

Drop cables shall be factory assembled.

Non-connectorized ends shall be suitable for heat fusion splicing as described in the subsection, Splices.

The manufacturer shall provide factory-testing information of each fully assembled fiber optic drop cable for each connector/fiber on tags attached to the individual or paired connector/fiber.

Drop cables shall be packaged individually within a plastic package marked clearly with the manufacturer's part number.

Field testing information of each Fiber Optic Drop cable (fully assembled) shall be according to subsection, Field Testing and Performance of Fibers. Documentation of testing shall be according to subsection, Documentation of Testing.

Fiber optic drop cables shall be equipped with:

1. Six optical fibers or number as specified in the plan.
2. Fiber optic connectors that are:
   a. compatible with the equipment being used for fiber strands with preset usage.
   b. in conformance with subsection, Connectors.
   c. factory installed unless otherwise allowed by the Engineer.
3. Drop Cable Fan-out Kits that feature the heavy duty Spider design. Install fan-out kits for connectorized ends to build up to 3 mm jacket.
4. Tubing that is 900 µm or 3 mm fanout as required by the application.
5. Buffer tubes protected by the cable sheath or fan out kit. Exposed buffer tubes are not acceptable.
6. Individual fiber strands protected by aramid fiber tubes.
7. Minimum tubing length: no requirement for this project.

Multimode Optical Fibers

Multimode (MM) 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: 62.5µm
2. Maximum Attenuation: 3.0/1.0 dB/Km at 850/1300 nm, respectively.
3. Maximum Dispersion: not applicable.
4. Dispersion Wavelength (ZWD): 1306.5 nm +-9.5 nm
5. Zero Dispersion Slope: < 0.101 ps/[nm2-km]
6. Cladding Diameter: 125 +/- 2.0 µm
7. Core-to-Cladding Offset (concentricity): < 0.8 µm
8. Cladding Non-Circularity: < 1.0%
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: not applicable

13. Attenuation Uniformity: No point discontinuity greater than 0.10 dB at either 1310nm or 850nm

14. This criteria number is not used on this project.

15. Cutoff Wavelength: not applicable

16. Maximum End-to-End Attenuation per cable length: 6 db

17. Fiber Light loss: at 1310 nm and at 850 nm, no requirements for this project, respectively.

18. Maximum cable outside diameter: no requirement for this project.

19. Fiber Polarization Mode Dispersion (PMD): not applicable.

20. Fiber Curl: no requirement for this project.

21. Proof Test: All Optical fibers shall be proof tested by fiber manufacturer

22. Attenuation at Water Peak: no requirement for this project
+Numerical Aperture: 0.2+-015.

23. Step Index: no requirement for this project.

24. Index of Refraction: at 1310 nm and 850 nm no requirements for this project, respectively.

Testing and Performance by Manufacturer:

Outdoor cable installations shall meet or exceed the requirements of the Fiber Optic Test Procedure criteria referenced in RUS 7 CFR 1755.9 and Bulletin 1753f-601 (PE-90) and these specifications.

The following requirements apply to the referenced Fiber Optic Test Procedure (FOTP):

1. TIA-455-3-A, 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 (-40° F to +160 ° F) shall not exceed 0.05 dB/km at 1300 nm for multi-mode fiber. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.6 dB/km at 1300 nm.

2. When a one-meter static head or equivalent continuous pressure is applied at one end of one-meter length of unaged 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 85° C for 168 hours and two cycles of –40 ° C to +70 ° C with cable held at these temperatures for 24 hours. At the end of this cycle, the cable will be decreased to +23 ° C and held for 24 hours. The water penetration test is completed at the end of the 24-hours hold. Testing shall be performed according to the industry standard test, TIA-455-82-B, FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable".

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 +65 ° C.

4. TIA/EIA-455-41-A, FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables": Ten percent of the fibers shall not experience a magnitude of attenuation change greater than 0.6 dB at 1300 nm (multimode fiber). The magnitude of the attenuation change shall be within the repeatability of the measurement system for the remaining 90% 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, FOTP-104, "Fiber Optic Cable Cyclic Flexing test": Change in attenuation shall not exceed 0.6 dB at 1300 nm for multimode fiber. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuations change greater than 0.6 dB at 1300 nm (multimode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.

6. TIA/EIA-455-25-C 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% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.6 dB at 1300 nm (multimode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.

7. TIA-455-33-A 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 he measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.6 dB at 1300 nm (multimode 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 FOTP-85, "Fiber Optic Cable Twist Test": The magnitude of the attenuation change shall be within the repeatability for the measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.6 dB at 1300 nm (multimode fiber). The average increase in attenuation for the fibers shall be <0.60 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 FOTP-181, "Lightning Damage Susceptibility Test for Optic Cables with Metallic Components: no requirement for this project.

10. TIA/EIA-455-37-A FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable": no requirement for this project.

11. TIA/EIA-455-98, FOTP-98-A, "Fiber Optic Cable External Freezing Test": no requirement for this project.

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.

Packaging Tag

The following information must be either stenciled on the reel, on a weatherproof tag firmly attached to the reel or a combination of both in order to trace the manufacturing history of the cable:

1. Optical Cable
2. Number of Fibers
3. Date cable was tested
4. Non-armored
5. Year of cable manufacture
6. Name of cable manufacturer
7. Gross weight
8. Part Number
9. Handling Instructions
10. Arrow indicating cable wind direction

Cable Data Sheet

Furnish the Engineer, who will provide copies to the MOA Traffic Department, cable

data sheets that contain the following information:

1. Manufacturer Name
2. Cable ID Number and fiber type
3. Factory Order Number
4. Cable Length
5. Factory measured attenuation (each fiber)
6. Index of Refraction
7. Bandwidth Specification (where applicable)

Sufficient cable length, in addition to the quantities shown on the Plans, 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% 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. Project the inner end of the cable a minimum of 6 ft into a slot in the side of the reel or into a housing on the inner slot of the drum, in such a manner to make it available for testing.

Include the manufacturers test documentation with each reel. This documentation indicates the attenuation of each cable fiber in dB/km (dB/ft), measured at 1300 nm for multimode fiber.

Mark each reel to indicate the direction in which it should be rolled to prevent loosening of the cable on the reel.

Connectors

Connectors: Furnish and install connectors (in-line or terminated ends) or attenuators as required in the Plans or as required to provide a fully operational fiber optic system.

Hybrid adaptors shall not be used to connect two different connectors. Instead, complete the interface using jumper cables with connectors that match the two incompatible connectors.

A Certified Technician, as described in these specifications, shall install connectors.

Connectors shall be ST connectors to assure compatibility with equipment as required for fibers with a preset usage and approved by the Engineer.

Ceramic ferrules shall be provided for fiber optic connector applications. Install connectors according to 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 -40° F to 160° F.

Connectors shall be factory installed except where approved by the Engineer.

Connectors shall be installed with ceramic ferrules with fibers secured within ferrule with epoxy, heat set or air dried, as specified by the manufacturer; machine polished mating faces shall be provided.

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.

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, Field Testing and Performance of fibers.

Repeatability of keyed connectors shall not exceed 0.2 dB.

Ceramic ferrule color coding for SC connectors, when used, shall be used as follows to identify type of connector polish as follows:

Attenuators

Attenuators shall be provided at no extra payment to the Contractor to achieve the desirable signal losses at the receiving end equipment (modems, etc.). Attenuators shall only be installed on the receiving end closest to the originating transmission.

Connecting ends shall be compatible to connectors described in subsection, Connectors.

Splice Closures

Fiber optic splice closures (FSC) shall be installed in the locations on the Plan 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.

Splice closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing factory test procedures and these specifications. The closure shall prevent the intrusion of water without the use of encapsulates.

Closure re-entry and subsequent reassemble shall not require specialized tools or equipment; these operations shall not require the use of additional parts.

Splice closures shall provide housing and storage for splices, stripped cable and undisturbed buffer tubes. Splice enclosures shall provide protection and strain relief to optical fibers.

Splice closures shall be suitable to handle straight, butt or branch splices.

Large Splice Closures

Splice closures 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, premolded and suitable for use with Coyote closures
5. Required accessories to complete splice.
6. One future cable entry kit for each splice closure.

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.

Provide enclosure with rubber tape for sealing around cables to provide a seal that compensates for expansion and contraction associated with temperature cycling.

Closure endplates shall be interchangeable with each size of closure available from the closure supplier.

Where additional access is required into an existing splice closure, replace the existing endplate with an endplate suitable for the task.

Use torque bars to secure, support and align end plates.

Splice closures must accept up to six cables in a butt configuration and 12 for in-line configuration without special adaptors.

Closure shall contain a permanent neoprene gasket seal.

All closures, including closing hardware, shall be from the same supplier.

External Shrader valve pressurization port shall be supplied.

The splice case 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.

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.

Fiber optic cables shall be restrained within the splice enclosure such that there is no discernible tensile force on the optical fiber.

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.

The closure shall be capable of accommodating splice organizer trays that accept mechanical, fusion, or multi-fiber array splices.

Splice cases shall hold a minimum of 2 splice trays with a maximum of number of splice trays to hold up to 96 splices.

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.

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.

Splice closure shall contain a basket allowing fiber buffer tube storage of exposed buffer tubes.

The splice case shall be UL listed for use in wet locations.

The closure shall be installed according to the manufacturer's recommended guidelines.

Splice Closures -Factory Testing Requirements: The construction and testing of the fiber optic splices and splice enclosures shall comply with applicable industry standards including: Electronic Industry Standards (EIA/TIA), ANSI and ASTM standards.

Compression Test: The closure shall not deform more than 10% in its largest cross-sectional dimension when subjected to a uniformly distributed load of 300 lbf (1335

N) at a temperatures of 0°F and 100 °F (–18°C and +38 °C). 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.

Impact Test: The assembled closure shall be capable of withstanding an impact of 21 ft-lbf (28 N-m) at temperatures of 10 °F and 100 °F (–12 °C and 38 °C). 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%.

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 @ 1300nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, on from each buffer tube or channel, or randomly selected in the case of a multimode fiber bundle. The measurements shall be taken from the test fibers, before and after assembly to determine the effects of the cable gripping and sealing hardware on the optical transmission of the fibers.

Vibrations Test: The splice organizers shall securely hold the fiber splices and store the excess fiber. 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.

Water Immersion Test: The closure shall be capable of preventing a 10-foot waterhead from intruding into the splice compartment for a period of 7 days. Testing of splice closure is to be accomplished by the placing of the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel maintain a hydrostatic head equivalent to 10 ft on the closure and cable. This process shall be continued for 7days. Remove the closure and open to check for the presence of water. Intrusion of water in the compartment containing the splices constitutes a failure.

Certification: It is the responsibility of the Contractor to ensure that either the manufacturer, or an independent testing laboratory has performed the above tests, 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.

Fiber Optic Connectors

With the following characteristics:

1. Factory installed or field installed ST or ST compatible connectors.
2. Ceramic ferrules and metallic connector bodies.
3. Maximum insertion loss: 0.50 dB. Maximum insertion loss of 1.0 dB is acceptable with approval of the Engineer.
4. Connector back reflection: greater than 35 dB.

Clean connectors with alcohol wipes and a compressed cleaning gas.

Closet Connector Module

Required in existing closet connection housings and hub shelters entered by fiber optic cables.

Characteristics:

1. Six fibers per module.
2. Six ST connectors.
3. Six strand factory made multimode pigtail.
4. Height equivalent to four rack units high.
5. Mate with existing closet connector housing.
6. Siecor CCH-CM06-61 or equivalent.

Stand Alone Video Optical Transmitter

Physical Characteristics

1. Maximum Size: 8 inch x 4 : inch x 1 2 inch.
2. Maximum Weight: 2.2 lbs.
3. Mounting Holes: 4 minimum.
4. Package: High quality aluminum, complete enclosure.
5. Indicators: LED type, neatly labeled and visible from mounted position.
6. User Settings: No user adjustments or settings.

Electrical Characteristics

1. Application: Single Fiber Uni-Directional RS-250C Medium Haul Video
2. Transmitter with bi-directional RS-232 data.
3. Modulation: Frequency Modulation or digital encoding.
4. Data Connector: DB 9 F.
5. Data Rate: up to 19.2 kbps, suitable for bursty data.
6. Bit Error Rate: 10-9 minimum over full optical range.
7. Video Connector BNC.
8. Power Consumption: 1-Watt maximum.
9. Video Signal to Noise: 50-dB minimum unweighted over full optical range.

Optical Characteristics

1. Physical: ST Type Connector.
2. Optical Range: 13 dB for multi-mode fiber.
3. Operating Wavelength: 1310 nm.
4. Backreflection: Tolerance of -35 dB.
5. Reliability: Mean Time Between Failure 500,000 hours.

Compatibility: directly interchangeable.

Rack Mount Video Optical Receiver

Physical Characteristics

1. Maximum Size: 8 inch x 4 : inch x 1 2 inch.
2. Maximum Weight: 2.2 lbs.
3. Mounting: Sliding Rack Mount Card with retainers.
4. Package: High quality aluminum, complete enclosure, compatible with rack mounting chassis.
5. Indicators: LED type, neatly labeled and visible from mounted position.
6. User Settings: No user adjustments or settings.

Electrical Characteristics

1. Application: Single Fiber Uni-Directional RS-250C Medium Haul Video
2. Receiver with bi-directional RS-232 data.
3. Modulation: Frequency Modulation or digital encoding.
4. Data Connector: DB 9 F.
5. Data Rate: up to 19.2 kbps, suitable for bursty data.
6. Bit Error Rate: 10-9 minimum over full optical range.
7. Video Connector BNC.
8. Power Consumption: 1-Watt maximum.
9. Video Signal to Noise: 50-dB minimum unweighted over full optical range.

Optical Characteristics

1. Physical: ST Type Connector.
2. Optical Range: 13 dB for multi-mode fiber.
3. Operating Wavelength:1310 nm.
4. Backreflection:Tolerance of B35 dB.
5. Reliability: Mean Time Between Failure 500,000 hours.

Compatibility: directly interchangeable.

663-2.03 COMMUNICATIONS VAULTS. Work under this item consists of installing communications vaults with bolt on lids according to the details shown on the Plans and as specified in the following.

Each vault shall consist of two sections that stack one atop the other and a lid that features nominal dimensions of 30-inches by 48-inches. The top and bottom sections shall measure 11 and 48 inches tall, respectively, and with a 3-inch overlap, shall provide an effective height of 56 inches. The vault shall have an open base.

The vault lid shall have a minimum design load of 15,000 pounds and include two pull slots, each 1/2-inch wide by 4-inches long. Furnish lids with a permanently recessed logo that reads "TRAFFIC". The lid surface shall have a coefficient of friction of 0.50 according to ASTM C 1028.

Furnish lids that contain steel rebar or mesh pieces completely encased within the lid to enable locating the vault with a metal detector. Provide lids with a minimum 1-inch of cover over the steel. Lid construction shall preclude the need to ground the lid.

Furnish vaults and lids that are gray in color and constructed of the polymer concrete material, "cosmopolite".

To keep water from entering the vault, install manufacturer-approved gaskets in the two joints in the vault: between sections and between the lid and the top section.

Furnish vaults with lids that can be bolted down with two 3/8-inch 16 UNC stainless steel pentahead bolts. Install the pentahead bolts and stainless steel washers upon acceptance of the completed fiber optic cable interconnect system.

Furnish each vault with brackets that support the length of fiber optic cable and any splice enclosure required in the vault. Furnish brackets recommended by the manufacturers of the fiber optic cable and splice enclosures. Furnish brackets made from corrosion resistant materials and anchor them with stainless steel hardware. These brackets shall be incidental to the communications vault.

The stainless steel hardware used to attach the fiber optic cable support assembly shall not fully penetrate vaults to prevent water intrusion.

Furnish vaults with conduit openings machined at the time of fabrication as shown on the vault detail sheets, or punch-driven at the time of placement. Size each opening to accommodate the 2-inch nominal UL-651B HDPE conduit called for in the Plans.

Furnish vaults with one 5 ¾-inch diameter knockout for future multiduct installation in those walls with one or no conduits. The knockouts shall be aligned across from each other to the extent possible.

663-3.01 CONSTRUCTION REQUIREMENTS FOR POLYETHYLENE DUCT SYSTEM. Install polyethylene conduits at least 36-inches below finished grade in trenches separate from those used to install the traffic signal and highway lighting systems.

Install clean conduits that remain free of water and earthen materials during and after installation. Before removing polyethylene conduits from their reels, install expandable rubber plugs in the conduit ends. When conduits are cut, install

expandable rubber plugs in all exposed conduit ends.

Install one-piece conduits between vaults. Fuse shorter sections together according to the conduit manufacturer's written instructions. The Department will not accept mechanical connectors for joining shorter sections of conduit together.

Install the polyethylene duct system without using elbows. Run the HDPE pipes straight through vault walls as detailed in the attached vault details sheets. After fully backfilling the conduit trenches and backfilling around the vaults, trim the HDPE pipes to protrude 50 mm inside the vault wall. Reinstall the expandable rubber plugs in the conduit ends

Mark underground ducts with a continuous strip of polyethylene marker taped four mils thick and six-inches wide. Furnish orange marker tape with a black legend that reads "CAUTION FIBER OPTIC CABLE BURIED BELOW". Install the tape 24-inches ±three inches below finished grade.

Keep junction boxes and conduit ends covered until starting to pull conductors. After installing the fiber optic cable, install special termination kits, recommended by the conduit manufacturer, to seal the conduits 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.

Install a 12 AWG stranded copper locate wire furnished with green insulation in the HDPE conduit system. The locate wire shall be approximately 4 feet longer than the run of conduit. Locate wires entering vaults shall be electrically connected together to provide a continuous locate signal throughout the conduit system for locating purposes.

Install conduit marker posts on approximate 200 feet centers. Each marker shall consist of a two inch perforated steel tube that supports a one-foot square, four line sign that reads "CAUTION FIBER OPTIC CABLE BURIED BELOW" in one inch tall series B lettering and a double headed arrow.

663-3.02 CONSTRUCTION REQUIREMENTS FOR FIBER OPTIC CABLE. Cable installation in conduit (duct) systems shall conform to Corning Cable Systems procedure SRP-005-011, "Fiber Optic Cable Placing-Duct", or manufacturer approved methods of jetting or pulling.

Submit a detailed construction plan and installation procedure for the Engineer's approval before cable installation.

Cable shall only be spliced in the following fiber optic cable vaults: C4, C7, and C11.

Only a certified technician, meeting the requirements of subsection, Certified Fiber

Optics Technician, shall complete the following work: cutting of fiber optic cable, if required, and all splicing, testing, and terminating of optical fibers.

Fibers should be tested upon receiving cable. The Contractor shall assume full responsibility to cable that is damaged if testing is not performed after receiving cable.

Before removing cable from a reel, remove nails, staples and other materials that might kink or damage the cable when it is unreeled.

Inspect cables before installation to ensure they are free of damage (nail or staple holes, jacket tears, kinks etc.), material and manufacturing defects, and dimensional non-uniformities that would:

1. Interfere with the cable installation using accepted cable installation practices.
2. Degrade the transmission performance and environmental resistance after installation.
3. Inhibit proper connection to interfacing elements.
4. Otherwise yield an inferior product.

Record the physical condition of the cable as outlined in subsection, Documentation of Field Testing.

Take necessary precautions to protect reeled cable from possible damage while unattended.

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.) must be used to install or retrieve cable from conduit ends in vaults, manholes or junction boxes.

When cable is installed by pulling, use a swivel and woven cable grip designed for fiber optic cable. Materials for lubricating shall be utilized when pulling.

Fiber optic cable lengths greater than 100 ft shall not be coiled in one continuous direction. Lengthy cables requiring multiple pulls shall be coiled in a "figure-eight" pattern at intermediated access points to avoid twisting of cable unless cable is assisted by jetting or winching. 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.

Cable shall be pulled in one continuous run. Splices are only allowed at the designated locations.

When a conduit run contains two or more cables, pull each cable individually when 2 or more 90° bends occur in the run. One continuous cable pull shall not contain more than one 90° bend.

When installing cables, monitor the tensile forces in the cable using equipment manufactured for this purpose. Monitoring equipment shall record the maximum tension incurred during each pull.

Required Replacement

The Contractor shall, at the Contractor's expense, replace cable runs subjected to one of the following conditions:

1. Recorded tensions exceeded the maximum tension of 600 lbs during pulling,
2. Cables were bent to a radius less than 20 x diameter of the cable during pulling,
3. Cables were bent to a radius less than 10 x diameter of the cable when they are coiled into the figure-eight pattern or otherwise handled.

Protect exposed cable from damage.

If cable ends are exposed and unattended, cable caps shall be taped onto cable ends to prevent ingress of moisture into the cable. If the duration of the exposed cable end is short, several wraps of tape shall be provided on the cable end.

Temporary aerial installation methods shall be consistent with Corning Cable Systems SRP-005-010, "Fiber Optic Cable Placing-Lashed Aerial" or a manufacturer approved methods.

Required Cable Slack

Furnish the following lengths of slack cable at the locations indicated:

1. 100-feet per splice vault
2. 65-feet per non-splice vault
3. 6-feet per controller/computer cabinet.

Neatly coil slack cable around the inside perimeter of manholes, vaults and junction boxes on cable brackets. Cable slack shall be supported as to not interfere with access into manholes, vaults or junction boxes.

Exceed manufacturer recommended minimum bend radii for loaded and unloaded conditions. If radii information is not available, minimum bend radii shall not be less than 20 times the diameter of the cable when loaded or 10 times the diameter of the cable unloaded (at rest).

Install fiber optic cable with marking tape, copper wire tracer and above ground markers as required in subsection 663-3.01 Construction Requirements For Polyethylene Duct System.

Splices

A Certified Technician as described in these specifications shall perform splicing and termination of optical fibers.

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; the proposed process to be used for splicing including procedure, cleave tool and specific fusion splicer to be used.

Splicing shall only be allowed in areas as designated on the Plans or as approved by the Engineer.

Splices and stripped cable shall be housed in a splice closure.

Mainline splices shall consist of end-to-end fusion splices for fibers (72 fibers typical) within the fiber optic cable where designated in the Plans.

Drop fiber splices (6 fiber typical) and drop cables (6-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.

Drop fiber splices shall consist of breaking out the required buffer tube(s) from the fiber optic trunk cable (72-count typical) and fusion splicing the appropriate number of fibers to the fiber optic drop cable (6 fibers typical). Remaining undisturbed fibers, if any, shall be protected in the splice tray. 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.

Splicing (drop splice) shall be performed for each device location at locations shown on the Plans. Splicing shall be performed according to Corning Cabling Systems Recommended Procedure SRP-004-013, Mid-Span Access of Fiber Optic Cable (Cable Slack Present), or an equivalent manufacturer's recommended procedure approved by the Engineer.

Cable ends involved in splicing shall match colors of the fibers and buffer tubes to the extent possible.

Fiber splices shall be contained within fiber splice closures (FSC) in designated locations shown on the Plans.

Splices shall be fusion splices protected with a heat shrink sealant (RTV fusion splices). Mechanical splices are not allowed.

Fusion splices shall be made with a portable fusion splicer, capable of AC or internal battery-powered operation. The unit must be able to splice fibers specified in these

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.

End-to-End splicing shall be performed according to written manufacturer instructions for the supplied splice closure units.

No stresses shall be placed on the fibers before or after the splice is completed.

Splice loss shall not exceed the limits described in subsection, Field Testing and Performance of Fibers .

Fan-out kits are required for splices to multiple fibers in the buffer tubes for multimode fiber (NCHRP).

Splices shall be located in the center of the slack cable in junction boxes, manholes or vaults.

Field Testing and Performance of Fiber

A Certified Technician, as described in subsection, Certified Fiber Optic Technician, shall perform all testing of optical fibers.

All fibers should be tested upon receiving cable. The Contractor shall assume full responsibility to cable that is damaged if testing is not performed after receiving cable.

Physical condition of the cable shall be recorded as outlined in subsection, Documentation of Field Testing.

The Contractor shall schedule the date, time and location of tests required by this specification with MOA Traffic Personnel (907-343-8355) 72 hours before performing the tests. MOA Traffic personnel shall be present when the tests are conducted. The certification technician shall demonstrate clearly how the tests are being performed and shall be made available to discuss testing strategies with MOA personnel.

Tests shall be conducted using standard operating procedures as defined by the manufacturer of the test equipment.

The following tests shall be conducted after the cable has been installed, spliced and connectorized. Test results shall be submitted according to subsection, Documentation of Field Testing (NCHRP). Tests shall be preformed before making permanent equipment connections. 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 on the installed cable and all existing fibers to which it is spliced or connected:

1. End-to-end Optical Time Domain Reflectometer (OTDR) testing 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 for multimode fiber.

   After completing the required work, test every fiber strand passing through splice trays that were opened by the Contractor.

   Conduct traces with a pigtail or fiber box between the OTDR and the fiber under test.

   Do not exceed launch transition of 6 dB.

   Provide traces with the following information:
   Horizontal Axis: Distance in Feet and Kilometers.
   Vertical Axis: attenuation scale in dB.
   Traces showing attenuation versus distance.
   Cursors positioned at cable ends.

   Tabulate for each trace: method, fiber type, wavelength, pulse width, refraction index, range, search threshold, reflection threshold, end threshold, warning threshold, backscatter, jumper length, file date, file time, fiber ID, cable ID, OTDR location, far end location, operator initials.

   Provide an event table showing events having more than 0.05 dB loss, containing event type, position from OTDR end, loss and reflectance.

   For cables less than 3300 ft (1 km) in length, the maximum total allowable attenuation is 1.0 dB.

2. Attenuation Test: Fiber links shall be tested with a standard power-meter test and 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.

3. Post Termination and Splicing Test:

Test every strand in cable segments including connectorized strands of drop cables.
Light Frequency: 1310 nm.
Direction: Bidirectional.
Location of test: Every field location required to obtain access to each cable segment.
Test after terminating and splicing at points shown on the Plans.
Cable Tested by: Certified Contractor Staff.
Department inspector witnesses and approves before final approval by the Engineer.
Acceptance Criteria:
Cable attenuation, 0.4 dB/km at 1310 nm excluding splices shown on the Plans or authorized by the Engineer.
Cable attenuation, 0.25 dB/km at 1550 nm excluding splices shown on the Plans or authorized by the Engineer.
Strand lengths are consistent.
Launch Transition < 6 dB.
No event > 0.30 dB.
Maximum splice attenuation 0.20 dB per splice unless otherwise shown on the Plans.
Trace available for each strand in cable segments.

4. Power Meter Test
Connect the light source to the connectorized fiber at the location identified on the Fiber Optic Test form. Connect a power meter to the other end of the fiber at the location identified on the Fiber Optic Test form.

Turn on the light meter and record the power received at the power meter in the appropriate location on the Fiber Optic Test form.

Specifically indicate the fibers tested on Fiber Optic Test form. Otherwise, test each strand in every cable segment including connectorized strands of drop cables.

Use the light frequencies of 1310 nm, or as indicated in test plans.

Perform the test uni-directional.

Test every field location required to obtain access to each cable segment.

A qualified member of the Contractor staff will perform testing.

A Department inspector witnesses and approves the results before final approval by the Engineer.

Acceptance Criteria:
Cable attenuation as called for in test plans.
Strand lengths are consistent.
Launch Transition less than 6 dB.
No event less than 0.30 dB.
Maximum splice attenuation 0.20 dB per splice unless otherwise shown on the Plans.
Trace is available for each strand indicated in test plans. Otherwise, trace will be available for each strand in each cable segment.

5. Light Source Test

Connect the light source to the connectorized fiber number at the location identified in the Fiber Optic Test Forms. Connect a power meter to the other end of the fiber at the location identified in the Fiber Optic Test Forms.

Testing:

Turn the light source off and on at a rate of approximately once per second for three cycles. Observe the power meter and record the response of the meter in the appropriate location on the Fiber Optic Continuity Test form. Indicate OK if the Contractor notes the meter responding to each of the three cycles. Indicate BAD for any other responses, such as no cycles, less than three cycles, or more than three cycles.
For each bad response, submit to the Engineer a statement summarizing the response.
A tone modulated light source may be used, in place of the three cycle method, to conduct this test.

Fiber Optic Continuity Test Form

Complete the ATMS Fiber Optic Continuity Test Form included at the end of this Section and submit the completed form to the Engineer. This form identifies the specific set up location for the power meter and light source.

Connect the light source to the connectorized fiber number at the location identified in the Fiber Optic Continuity Test Form.

Connect a power meter to the other end of the fiber at the location identified in the Fiber Optic Continuity Test Form.

Turn on the light meter and record the power received at the power meter in the appropriate location on the Fiber Optic Continuity Test Form.

The Fiber Optic Continuity Test Form identifies the specific set up location for the

power meter and light source.

Fiber Optic Cable Loss Limits

Fiber optic cable loss limits shall be according to the following: The Engineer may elect to allow bi-directional averaging of OTDR testing due to splice loss core alignments.

No event shall exceed 0.10 dB. If any event is above 0.10 dB, repair or replace that event location.

Total dB loss of a cable fiber less events shall not exceed +3% of the factory test or 1% of the manufacturer's published production loss at 1310 nm. Cable fiber loss shall not exceed Maximum Attenuation Limits as defined in subsection, "MultiMode Fiber Optic Cable".

Cable Fiber Loss (dB) = Total Loss (dB) - $\sum$ events (dB)

Cable Fiber Loss (dB/km) = Cable Fiber Loss (dB)
Cable Fiber Length (km)

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 no expense to the Department.

Fusion splice losses shall not exceed 0.10 dB per fiber. Mechanical splices, where allowed, shall not exceed 0.30 dB.

Each connector, 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.

If event losses exceed these specifications, event locations shall be replaced or repaired without additional cost reimbursement for expenses.

If total loss exceeds these specifications, Fiber Optic cable shall be replaced or repaired without reimbursement for expenses.

All fibers within the cable shall be usable.

Contact the Engineer 48 hours before performing acceptance testing (Post Termination and Splicing OTDR and Power Meter).

Perform fiber optic testing with an OTDR capable of producing output files compatible with the Siecor OTDR 383PCW Version 1.21 or higher.

Documentation of Testing

Upon completion of the field tests, 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. Electronic submittal to Engineer on floppy disk or CD is also required.

Documentation from manufacturer shall include manufacturer data of cable and fiber including: Optical performance (OTDR) including dB/km loss measured at 1310 nm for multimode, 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 of the cable part numbers, manufacturer, cable length markings, as-built cable routing map, 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	Operator Name
Cable ID	Date and Time
Fiber ID (include tube and fiber color)	Date of installation
Cable Location – begin and end point	Fiber Count
Cable (i.e multimode, loosetube, OSP, OFNG-nonconductive general etc.)	

2. Setup Parameters:

Wavelength	Range (OTDR)
Pulse Width (OTDR)	Scale (OTDR)
Refractory index (OTDR)	
Jumper and/or Launch Box Length	

3. Test Results:

a. OTDR Test:

Total Fiber Trace (mile)	Total Length (OTDR) (mile)
Splice Loss/Gain	Events > 0.05 dB
Measured Length (Cable Marking)	Backscatter

Provide traces on Diskette to Engineer

b. 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 specified in subsection, Field Testing and Performance of fibers.

Submit to the Department and maintain on file a current calibration certificate for the OTDR being used.

Submit Power Meter/Light Source Test results to the Department for acceptance (Fiber Optic Continuity Test Form).

Submit to the Department and maintain on file a current calibration certificate for the Power Meter/Light Source being used.

663-3.03 CONSTRUCTION REQUIREMENTS FOR COMMUNICATIONS VAULTS. Do not install vaults in or near the ditch bottoms, in areas that collect drainage, or where vehicular traffic is anticipated. If a vault in a broad area that collects drainage cannot be avoided, install the top of the vault one foot higher than the drainage outlet and fill around the vault with Selected Material Type A placed on a 4:1 slope.

To the extent possible, install vaults at the locations shown on the Plans. If a vault needs to be moved, the distance between adjacent vaults shall not exceed 1000 feet (305 meters).

Under all vaults, place a 48-inch by 66-inch sump that is 12-inches thick and consists of coarse aggregate for concrete conforming to subsection 703-2.02 of the Alaska Standard Specifications for Highway Construction.

After installing the conduits, fill the gaps between the conduits and the sides of conduit openings with a self-curing caulking that provides a permanent, flexible rubber that is unaffected by sunlight, water, oils" mild acids and alkali. The cured compound shall be mildew resistant, non-flammable, and gray in color. The material shall provide a permanent bond with the polymer concrete. Allow caulking to fully cure per the manufacturer's written installation instructions before placing backfill around the vault.

Install the fiber optic cable support assemblies according to the vault manufacturer's written instructions.

663 4.01 METHOD OF MEASUREMENT. 663 items will not be measured.

663 5.01 BASIS OF PAYMENT. HDPE conduit shall be incidental to Items 669

(1A) through 669 (1D) and includes furnishing and installing materials, including plugs, locating wire, and marker posts and all excavation, backfilling, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work.

Payment for fiber optic cable shall be incidental to Items 669 (1A) through 669 (1D) and includes furnishing and installing all materials, including drop cables, splice closures; and for all labor, tools, equipment and incidentals necessary to complete field tests and splicing.

Payment for each communications vault shall be incidental to Items 669 (1A) through 669 (1D) and includes furnishing and installing all materials, including, lids, gaskets, pentahead bolts, washers, fiber optic cable support assembly with stainless steel mounting hardware, caulking, and coarse concrete aggregate; for all excavation, backfilling, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work.

Add the following Section:

SECTION 669

COMMERCIAL VEHICLE INFORMATION SYSTEMS AND NETWORKS (CVISN)- AUTOMATIC VEHICLE IDENTIFICATION, REMOTE VIDEO MONITORING CAMERA SYSTEMS, OVER-HEIGHT VEHICLE DETECTION AND WARNING SYSTEM, AND BACKUP DETECTION

Special Provisions

669-1.01 DESCRIPTION. Furnish and install the following systems at the locations indicated and as shown on the Plans. Install physical infrastructure only. Personnel of the State of Alaska Division of Measurement Standards and Commercial Vehicle Enforcement (MSCVE) will provide data collection and processing functionality.

1. Glenn Highway Northbound Weigh Station.

The Automatic Vehicle Identification (AVI) and Unattended Weigh Station Operation (UWSO) systems are expansions of the International Road Dynamics (IRD), Inc Weigh In Motion System that was installed south of the Glenn Highway Northbound Weigh Station.

The main difference between the Glenn Highway Northbound (GNB) and Glenn Highway Southbound (GSB) Weigh Stations is that the GNB Weigh Station facility has a Weigh-In-Motion (WIM) installed for the northbound direction and the GSB Weigh Station has no WIM for the southbound direction. AVI for the GSB will screen vehicles based on safety and credential information and relay safety-related data between individual carriers and weigh station enforcement personnel.

a. System Overview

1. As the vehicle approaches the GNB Weigh Station, and AVI transponder reader reads the in-cab transponder tag and a WIM device collects weight and vehicle data.

2. Weight and vehicle data from the WIM, and AVI transponder tag from the Advanced AVI (1st pole) is sent from the WIM and AVI cabinets to the GNB Weigh Station Roadside Operations Computer.

3. At the Advance AVI location two cameras with video and still frame capture capability, both day and night, will capture the Department of Transportation and Alaska Identification tag information. The first camera is aligned perpendicular to the direction of travel and in line with the first WIM loop detector in the right lane. The second

camera is located 20 feet downstream of the first and aimed at the same first loop in the right-hand lane. Both cameras are triggered on the first loop in the right hand lane at the WIM station. The first camera is used with a frame grabber to capture multiple images of the vehicle identification tag on the right-side door. The second camera has a wide-angle lens suitable to view the entire vehicle for visual screening of vehicle and load characteristics. The video system will include installation of video cable, and infrared illuminator and camera control cable. Cameras will have a lowering device for maintaining the camera. The control system for the wide-angle camera will include pan, tilt and zoom capabilities.

4. The Contractor shall provide an overhead AVI system that will include the AVI antenna, roadside electronics, lead-in cables as required, support poles, foundations, and mounting hardware. The AVI system shall have two readers installed, one in the WIM Mainline cabinet and one in the cabinet at the ICN antenna pole; and two antennae installed over the northbound lanes of Glenn Highway. The Advance AVI antenna will be centered over the right lane. The ICN AVI antenna will be centered over the middle lane. The location for the overhead AVI system shall be as shown on the Plans. The AVI system shall have hardware and software interfaces for communications with the WIM, Weigh Station, and Enforcement Remote Video Monitoring System (RVMS) Camera system. The AVI compliance system shall be done according to this Section and manufacturer's recommendations.

5. Vehicle screening for the GNB direction only, includes over-height vehicle detection and warning (OVDS) system.

6. The GNB Weigh Station roadside Operations Computer using CRISS software will make a screening decision based on vehicle data including weight, XCVIEW and SAFER snapshot safety information. The objective is to let safe carriers bypass and concentrate on high-risk carriers.

7. The Roadside Operations Computer screening decision will be forwarded to the 2nd AVI In-Cab Notification (ICN) transponder writer.

8. From the ICN, the vehicle transponder will receive either a red light to report or a green light to bypass the weigh station. Also, at the ICN location, a video camera will take the image of the vehicle, so that staff will know which vehicle to look for to enter the weight station.

9. The exit ramp loops/ piezo detectors track incoming vehicles. The loop detectors and piezo detectors at the exit ramp on the GNB facility have been installed. These detectors provide notification to the GNB Weigh Station personnel that a vehicle has exited the highway and entered the ramp to the GNB Weigh Station. The vehicle classification including number of axles is provided to the GNB Weigh Station personnel based on the loop and piezo detector data at the exit ramp, just downstream of the physical gore. The loop detectors on the exit ramp near the gore also provide notification to the weigh station personnel when the exit ramp is full.

b. Required Work

1. Install the AVI antennae and transponders on new mast arms and support pole and install foundations, conduit, junction boxes and cable to the cabinet for Glenn Highway Northbound only. Install the trunk fiber optic cable in new communications vaults and conduit from the existing cabinet at the WIM slab to the GNB Weigh Station. The Advance AVI antenna will be located approximately 10-feet downstream from the WIM Cabinet and at least 30 feet from the edge of travel way or fog line. The Advance AVI antenna for GNB will be supported through the existing WIM cabinet. The reader unit for the Advance AVI antenna will be located in a CBA2 cabinet. The In-Cab Notification Antenna will be located approximately 1000 feet downstream or north of the WIM Slab and WIM electronics cabinet. The antenna reader unit cabinet will be mounted on the ICN pole shaft. The dimensions of the reader unit shall be 30 inches high, 25 inches wide, 12 inches deep in a self-contained unit.

2. Install two cameras for enforcement, vehicle identification and visual screening of vehicle and load characteristics at the Advance AVI location for the GNB direction only, i.e. remote video system for the GNB. The two cameras will be located on separate poles, one wide angle to capture images of the entire vehicle and one to capture the USDOT identification number. The cameras will be supported for power and data from the WIM cabinet. This project includes installation of conduit and junction boxes connecting the cameras to the WIM cabinet. This project includes the installation of pan, tilt, and zoom (PTZ) control for the wide-angle camera. Install a lowering pole for the side-shot camera.

3. Install over-height vehicle detection for the GNB by installing the over-height vehicle detector transmitter/receivers on both sides of the Glenn Highway at the Advance AVI location. The over-height vehicle detector on the southbound side of the highway will be mounted on its own pole, while the detector on the northbound side will be mounted on the Advance AVI pole. Power for the detector on

the southbound side of the highway will be provided by boring under the highway. Power for the overheight system will be provided from the existing WIM cabinet. Install new conduit and junction boxes for the over-height vehicle detection and warning system as shown in the Plans. Data will be provided to the GNB Weigh Station and integrated into the vehicle screening and in-cab notification protocols.

4. Install a second AVI ICN transponder writer and the mast arm and support pole. Install the fiber-optic cable, junction boxes, conduit, and cabinet for the ICN transponder writer.

5. Install a type CBA3 cabinet on the existing cabinet foundation installed in a previous contract for WIM installations. A central unit shall be installed inside the CBA3 cabinet. Install modems in the controller cabinet compatible with the host computer.

2. Glenn Highway Southbound Weigh Station

a. Install the AVI antennae and transponders on mast arms and support poles and install foundations, conduit, junction boxes and cable to the cabinet for Glenn Highway Southbound only. Install the trunk fiber optic cable in new communications vaults and conduit from a new CBA3 cabinet 3000 ft north of the GSB weigh station to the GSB weigh station. The Advance AVI antenna will be located approximately 10-feet downstream from the new cabinet and at least 2 feet from the edge of the paved multi-use path. The electronics for the AVI antenna will be located in the new cabinet. The In-Cab Notification Antenna will be located approximately 1000 feet downstream or south of the new cabinet and the antenna reader unit cabinet will be mounted on the ICN pole shaft. The dimensions of the reader unit shall be 30 inches high, 25 inches wide, 12 inches deep in a self-contained unit.

b. Install the remote video system for the GSB. Two cameras will be located at the GSB Advance AVI location. One captures the USDOT identification and one provides a wide-angle view of the vehicle being weighed and screened. These cameras will be serviced from the new CBA3 cabinet at this location.

c. Install the loops, piezo detectors, and CBA3 cabinet at the GSB location. Data from the GSB compliance loops and piezo detectors will be supported from a central unit and data communication equipment located in a new CBA3 cabinet near the beginning of the exit ramp. Data will be transmitted to the GSB Weigh Station building and then transmitted to the GNB Weigh Station via a new

fiber optic cable in a new conduit beneath the Glenn Highway as well as the weigh station area and scales.

d. Install the Remote Vehicle Monitoring System (RVMS) equipment at the Glenn Highway Southbound (GSB) Weigh Station. One camera will capture the identification information on the vehicle right-side door. The second camera with wide-angle capability will be used to observe the overall vehicle and load.

e. Install a pair of 12-strand fiber optic cables in new conduit under the Glenn Highway between the Glenn Highway Northbound weigh station and the Glenn Highway Southbound weigh station.

3. Seward Highway (at 80th Avenue).

The Remote Vehicle Monitoring System is an expansion of the International Road Dynamics, Inc (IRD) Weigh In Motion (WIM) System that was installed along the Seward Highway south of 76th Avenue. This facility already has WIM sensors installed for both north and southbound traffic.

a. System Overview

1. As the vehicle approaches the Seward Highway at 80th Avenue, a WIM device collects weight and vehicle data.

2. Weight and vehicle data from the IRD WIM is sent from the IRD WIM cabinet to the Roadside Operations Computer. Data is relayed via a telephone line to enforcement personnel.

3. At the Seward Highway at 80th Avenue facility location for both directions of travel, two cameras with video and still frame capture capability, both day and night, will capture the Department of Transportation and Alaska Identification tag information. The first camera is aligned perpendicular to the direction of travel and in line with the first WIM loop detector in the right lane. The second camera is located 20 feet downstream of the first and aimed at the same first loop in the right hand lane. Both cameras are triggered on the first loop in the right hand lane at the WIM station. The first camera is used with a frame grabber to capture multiple images of the vehicle identification tag on the right-side door. The second camera has a wide-angle lens suitable to view the entire vehicle for visual screening of vehicle and load characteristics.

a. Required Work

1. Install two cameras for vehicle identification and visual screening of vehicle and load characteristics at the Seward Highway at 80th

Avenue WIM facility location for both directions of travel. The two cameras will be located on separate poles. The cameras on the east side of Seward Highway will be supported for power and data from the WIM existing cabinet. The cameras on the west side of Seward Highway will be provided with a new cabinet for power and data support that will be powered from the existing WIM site.

2. Install a new fiber optic cable under the Seward Highway to connect the cameras on the west side to the existing WIM cabinet and the telephone interface.

3. Install conduit and junction boxes connecting the cameras to the intermediate cabinet and for the new conduit and junction boxes necessary to traverse Seward Highway. The poles for the cameras will be capable of being lowered to provide ease of camera maintenance and adjustment.

3. Port of Anchorage, Ocean Dock Road.

The Ocean Dock Road facility has a WIM installed for the southbound direction.

The Ocean Dock Road facility has an AVI system installed with two Antennae.

a. System Overview

1. As the vehicle approaches the Port of Anchorage along Ocean Dock Road, a WIM device collects weight and vehicle data.

2. Weight and vehicle data from the WIM is sent from the WIM cabinet to enforcement personnel via a telephone line.

3. At the Ocean Dock Road facility location for the outbound or southerly direction of travel, one camera with wide-angle video capability will be installed. Another camera will be installed to capture the vehicle identification tag on the vehicle door. An illuminator will be provided. The wide angle camera and the illuminator will be located on the existing lighting pole that is just south of the most southerly WIM loop in the southbound lane. This existing loop is located approximately 50 feet from the light pole and the camera in the southbound lane exiting the Port facility. The other camera will be mounted on the existing AVI pole shaft and will be aligned with the loop such that a vehicle traversing the loop will trigger the camera to begin capturing images.

a. Required Work

1. Install a camera and an illuminator for visual screening of vehicle and load characteristics at the Port of Anchorage Ocean Dock Road facility location. Install a new cabinet for housing the electronic components supporting the camera on the pole. Install a camera for capturing USDOT vehicle identification numbers on an existing pole at the Port of Anchorage Ocean Dock Road facility.

2. Install conduit, cables, and junction boxes connecting the camera to the cabinet, controller and supporting electronic components. Provide power for both cameras from the existing Type 2 load center.

669-1.02 REGULATIONS AND CODE. Use materials and workmanship that conforms to the standards of the Underwriter's Laboratories, Inc. and the National Electrical Safety Code and local safety code requirements, where applicable.

Use electrical equipment that conforms to the standards of the National Electrical Manufacturer's Association, where applicable.

669-2.01 MATERIALS. Unless otherwise stated, provide new materials that meet the requirements of subsection 660-2.01, Materials, and the following:

1. Wiring. Use single wire conductors and cables that have clear, distinctive and permanent markings on the outer surface throughout the entire length giving the manufacturer's name or trademark, insulation type-letter designation, conductor size, voltage rating and the number of conductors if a cable. Home run label wires and cables in each junction box and cabinet; for example, W1SLA (for wire) and GaSLA (for cable) as shown on the Plans.

2. Conduit. Use RMC or HDPE, as shown in the Plans, for conduits, except for PVC conduit forming the inductive loops and as shown on the Plans. Use grounding bushings that are plastic-sleeved to minimize the potential for insulation damage during wire pulls.

3. Junction Boxes. Label the covers of junction boxes used for loops or sensor wires 'TRAFFIC'. Label the covers of junction boxes used to provide electrical service to ATR related installations 'ELECTRIC'. Keep junction boxes for 120V/240V electrical service completely separate from junction boxes containing loop or sensor wiring

4. Terminal Blocks. Use terminal blocks with nickel, silver or cadmium plated brass binder-head screw terminals. Use barrier type terminal blocks rated 600 VAC at 20 Amps, sized for 12-18 AWG wire with removable shorting bars in each position and with integral type marking strips.

5. Presence Loops. Use UL listed IMSA specification #51-5-1984 single

conductor PVC nylon with tube jacket, type THHN, #14 AWG conductors for detector presence loops.

Use twisted pairs of 18 AWG stranded tinned copper wire for multiple pair loop lead-in cable. Each twisted pair shall have its own 20AWG tinned copper drain wire. An aluminum foil shield shall surround each individual bundle of twisted pair and drain wire. Multiple pair loop lead-in cable shall have an overall PVC or PE outer jacket.

6. Electrical Load Centers. Use NEMA Type 3R Electrical Load Centers and provide a 120/240V 100 amp single-phase, three-wire-circuit electrical service.

7. Style CBA cabinets. Use cabinets that meet or exceed a NEMA 3R rating. In addition, CBA cabinets shall meet the following requirements:

   a. Cabinet Dimensions. Provide a 39 inch high, 28 inch wide, and 16 inch deep cabinet for where CBA2 cabinets are called out. Provide a 77 inch high, 44 inch wide, and 27 inch deep cabinet where CBA3 cabinets are called out.

   b. Cabinet Construction. Construct the cabinet and door from 5052-H32 or better sheet aluminum alloy with seams ground to a smooth finish, unpainted, with a smooth grain finish on the exterior, with stainless steel hinges and fittings. Provide a totally enclosed, six sided cabinet with full frontal access.

   c. Door. Provide a full frontal access door with rolled flanges and neoprene rubber gaskets with stops to hold the door in a fully opened position. Provide stiffeners and a plan pocket on the interior of the door. Provide ventilation using louvers and replaceable filters in the lower part of the door. Provide filters that allow air flow and block dust and snow from entering the cabinet. Protect filters with a ventilated metal plate on the exterior. Ensure that there are no other auxiliary doors or openings to the cabinet.

   d. Latch/Lock. Use a 3-point draw roller type latching mechanism. Use stainless steel or cadmium plated, Type II Class 1 center catch and pushrods. Use nylon rollers with a minimum diameter of ¾-inch. Furnish a stainless steel operating handle with a ¾-inch shank. Use a Corbin #2 lock keyed lock that matches existing HDS cabinets. Furnish two keys with each lock.

   e. Shelves. Mount adjustable equipment shelves on rails inside of cabinet and support them on both sides. Locate rails for horizontal adjustment at the top and bottom of both sides of the cabinet. Mount 4

vertical rails on both sides of the cabinet, and 4 on the back for a total of 12 inside each CBA3 cabinet.

f. Ventilation. Provide ventilation with louvered vents in the front door with a removable air filter. Ensure louvers satisfy the NEMA rod entry test for 3R ventilated cabinets. Ensure the filter covers the vents and is held firmly in place with bottom and top brackets and a spring-loaded top clamp. Vent exhaust air out between the top of the cabinet and the door.

g. Circuit Breaker Panelboard. Provide an enclosed circuit breaker panelboard mounted as shown on the Plans. Ensure the panelboard is rated for 100 Amps, MLO, 120/240 Volts, Single Pole, 3 wire, NEMA 1, 10,000 AIC. Provide surge protection with the panelboard. Provide 4 20 Amp circuit breakers on the panelboard, and 2 spares. Furnish a SQD Q0612100F/S panelboard or approved equal.

h. Receptacles. Install 4 duplex one-quad, four-outlet, 110-volt receptacles with GFCI protection and LED indicator lights, in the cabinet as shown on the Plans.

i. Cooling Fan. Provide a thermostatically controlled fan in the top of cabinet that operates at a settable high temperature limit and exhausts air through a filtered and hooded vent at the top front of the cabinet.

j. Interior Light. Provide a fluorescent, 120-volt single-tube lamp interior light fixture rated at 13 watts minimum with a ballast that will start the lamp at temperatures of 0°F. Provide a single pole, illuminated-toggle switch, mounted inside of the cabinet door to control the light.

k. Thermostatically Controlled Outlet. Provide a thermostatically controlled single duplex outlet that operates at a settable low temperature limit.

l. Low Temperature Power Cutoff. Provide a thermostat to control electrical power to the WIM electronics which turns off power to the WIM computer when the internal cabinet temperature drops below the manufacturer's recommended limit (only applies to CBA3 cabinets).

m. Thermostats. Provide remote bulb-type thermostats with SPDT contacts, rated for 16 amps @ 120 VAC for combined motor and resistive loads, for the thermostatically controlled outlet and cooling fan. Ensure the thermostats for the "Thermostatically Controlled Outlet" have a contact that closes on lowering temperature and set at 50°F. Provide a thermostat for the "Cooling Fan" that has a contact

that closes on rising temperature and set at 90°F. Mount sensing bulbs as shown on the Plans.

n. Terminal Blocks. Mount terminal blocks vertically on the left side of the cabinet as shown on the Plans.

o. Conduit. Provide EMT, liquid tight metal flex or metal clad conduit for all wiring in 120V equipment including circuit breaker panel boards, lights, vent fans, and power receptacles. Terminate other low voltage wiring on terminal blocks and neatly train within the cabinet using wiring duct or ties.

p. Keyboard Tray. Mount a retractable tray to the bottom of the shelf at a convenient height for operation of the keyboard (only applies to CBA3 cabinets).

q. Certification. The Cabinet Assembly consists of the cabinet itself and all high voltage (greater than 24 volts) components that are permanently installed, including the circuit breaker panel, receptacles, light and fan as shown on the drawings or described herein. Obtain certification that the cabinet and associated permanently installed equipment, as a unit, complies with recognized applicable national standards through an authorized local or national testing agency or fabrication shop that complies with ANSI Z34.1-1987 "Third-Party Certification Programs for Products, Processes, and Services", including but not limited to; Electrical Testing Laboratories (ETL), Underwriters Laboratories (UL), Canadian Standards Association (CSA), Electro Test Incorporated (ETI), or other certified testing agency recognized by the Labor Standards & Safety Division of the State of Alaska Department of Labor.

8. Pavement. Pavement materials shall meet the following requirements:

a. Asphalt Pavement. Section 401, Asphalt Concrete Pavement for Asphalt Concrete, Type II, Class A and shall be approved by the Engineer.

b. Concrete Pavement. Section 501, Structural Concrete, and the amendments contained herein.

9. Day/Night Vehicle camera. DS-5000 Digital Dual Channel CCTV Camera Color/monochrome Intensified Night DS-6000.

Model: DS-5000, DMS 6000, or latest model
Manufactured by: Detection Systems & Engineering Co.
1450 Temple City Drive Troy, MI 48084
810.649.1310

10. Piezoelectric Sensor, Class II. (3.05 m)

a. Center Core: 16 gauge, flat, braided, silver plated copper wire.
b. Piezoelectric Material: Highly compressed piezoelectric copolymer, P(VDF-TrFE).
c. Outer Sheath: 0.406 mm thick brass, CDA-260, ASTM B 587-88.
d. Final Dimensions; 6.6 mm wide x 1.6 mm thick; ±0.13 mm.
e. Insulation resistance between core and shield: > 500M ohms.
f. Piezoelectric Coefficient: ≥ 20 pC/N – nominal.
g. Passive Signal Cable: RG 58 type with a underground/direct burial rated outer jacket. The OD of the cable is 4.75 mm. The nominal capacitance of the cable is 89 pF/m.

11. Automatic Vehicle Identification Reader. 2-way communication between host computers and in-vehicle transponders using AST v6 Slotted-Alha Time Division Multiple Access (TDMA) protocol.

Model: FP-100RA – ASTM V6 Reader
Manufactured by: FastPass Ltd (subsidiary of Telematics Wireless)
26 Hamelacha St.
Holon 58117, Israel
972.3 557.5720

12. Automatic Vehicle Identification Antenna. May be one of the following:

a. Radome-protected Yagi Antenna 890-960 MHz

Model: RY-900A
Manufactured by: Kathrein
Scala Division
PO Box 4580
Medford, OR 97501
541.779.6500

b. Sinclair Dipole Antenna 900-960MHz

Model: 4701-8134
Manufactured by: Sinclair Technologies Inc.

13. Day/Night Vehicle camera. DS-5000 Digital Dual Channel CCTV Camera Color/monochrome Intensified Night DS-6000

Model: DS-5000, DMS 6000, or latest model
Manufactured by: Detection Systems & Engineering Co.
1450 Temple City Drive Troy, MI 48084
810.649.1310

14. Camera Mounting Kit and Illuminator Mount. Pelco Camera J mount to pipe or pole, Pelco Camera Illuminator, and Pelco Camera IR Mounting Bracket.

Model: EM2000, LL27WF, and LL27M
Manufactured by: Pelco
3500 Pelco Way
Clovis, CA 93612-5699
800.289.9100

15. Vehicle Imaging System. Camera Standard Resolution Progressive Scan RS-170 converted output & memory to capture commercial vehicle door image & U.S. DOT Number, Flash Head Xenon Tube 17-watt Light Sensor Spectrally filtered CMOS Photodiode, Flash Power Supply AC/DC, 12V to 28V DC or 90V to 270V AC. Base plate to secure Vehicle Imaging Subsystem cables and electrically connect outer cable shields.

Model: TM-9701TC or latest model,
PULNiX Vehicle Imaging Subsystem TNF-20 FH-S,
TLS-200,
TNF-20 PS-L, and
VIS J-Panel
Manufactured by: PULNiX America, Inc.
800.445.5444
1330 Orleans Dr.
Sunnyvale, CA 94089

16. Multi Mode Cable. May be one of the following:

a. 2 –288 Fiber Optic Cable with 12-fibers, MultiMode

Manufactured by: Pirelli Cables and Systems North America
700 Industrial Dr.
Lexington, South
Carolina 29072-3799
803.951.4800

b. Altos All-Dielectric Cables 288-fiber optic cable

Manufactured by: Corning Cable Systems LLC.
PO Box 489
Hickory NC 28603-0489
800.743.2675

17. Fiber optic LAN Media converters. Fast Ethernet Media Converter UTP-ST Fiber 100Mbps

Model: AT-MC101XL-10
Manufactured by: Allied Telesyn

18. Operator work station. IBM NetVista S42 Pentium 4, 2.4GHz 256MB 40GB XPP

Model: 831941U
Manufactured by: IBM

19. Overheight Vehicle Detection System. Double Eye Z-Pattern Visible Red/Infrared.

Model: 3400-Z
Manufactured by: Trigg Industries International
West Coast
7007 Willoughby Ave Los Angeles, CA 90038
323.845.9503

20. UnixWare7. Business Application Server to perform multiple mission critical tasks currently running on RISC UNIX, SCO OpenServer or Windows NT

Model: Business Edition
Manufactured by: Santa Cruz Operation
350 South 520 West
Suite 100
Lindon, UT84042
801.765.4999

21. Surge Protection. Filtering Surge Protector absorbs power line noise and switching transients, and lightening protection. Vehicle Loop Detection 3-terminal device, two of which are connected across the signal inputs of detector for differential mode protection, and third terminal is grounded to protect against common mode damage.

Model: ACP 340 and SRA6LCA
Manufactured by: EDCO Inc.
1805 N.E. 19th Ave
Ocala, FL 34470
800.648.4076

22. Permanent Loop Kit.

Model: 8050
Manufactured by: International Road Dynamics, Inc.
702 43rd Street East
Saskatoon, Saskatchewan S7K 3T9 Canada
Telephone 306.653.6600
Fax 306.242.5599

23. Miscellaneous.

Communication between the AVI reader and other devices shall be through RS232C interface with a minimum rate of 9600 baud, asynchronous.

A serial I/O card shall be a Fastcom 422 dual channel RS-422/RS-485 adapter card, with a baud rate up to 288k and FIFO buffering.

The Contractor shall provide 6 transponders as part of the system. The transponders shall be suitable for installation in commercial vehicles and shall communicate with the AVI system via dedicated short-range communication (DSRC).

Miscellaneous items required to be provided by the Contractor include but are not limited to wiring, CBA3 cabinet and its ventilation, heating/cooling systems, light, security, and battery pack.

Contractor/Vendor Responsibility

(1) Check equipment before construction to verify proper quantity and type of equipment for site.
(2) Perform a site survey to verify that the equipment will not be affected by the possibility of electromagnetic and other radio signal interference.
(2) Perform pre-installation tests on sensors, detectors, cameras, antennas and other equipment to verify operation.
(3) Provide equipment that will be rugged and reliable, built to withstand and operate in cold weather, high winds, snow, rain, heavy industrial, marine, rail and traffic environments.

669-3.01 CONSTRUCTION REQUIREMENTS. Meet the requirements of subsection 660-3.01 Construction Requirements, and the following:

1. Wiring.

   a. Termination. Terminate unused pairs at junction boxes within splices. Terminate unused pairs in terminal blocks at cabinets. Terminate and solder conductors, including unused spares to "spade" type terminal lugs at terminal blocks.

   b. Relief. Provide at least 2 feet of slack cable for all wiring in each junction box and at least 6 feet of slack cable available in the equipment cabinet prior to the terminal block.

   c. Labeling. Label wiring in junction boxes and at terminal blocks.

2. Conduit.

   a. Pull Cords. Leave nylon pull cords in conduits larger than 1 inch and in spare conduits.

   b. Bushings. Ensure that plastic or plastic-sleeved bushings are in place before wire pulls are performed.

3. Junction Boxes.

   a. Voltage Limitation. Junction boxes used for ATR installations shall not contain any wiring of systems at or greater than 24 V or conduits carrying wiring of systems at or greater than 24 V.

4. Terminal Blocks.

   a. Terminal Block Placement. Mount terminal blocks within cabinets so that terminals are easily accessible from the front of the cabinet.

   b. Labeling. Clearly label terminal blocks and wire pairs on the block.

   c. Termination. Terminate and solder conductors, including unused spares to "spade" type terminal lugs

5. Presence Loops.

   a. Placement Design Adherence. The Plans are not schematics; installation of the presence loops shall closely conform to the location and layout of conduit runs shown in the Plans.

   b. Presence Loop Dimensions. Unless otherwise noted, form presence loops using four turns of wire, making a 6 feet square with a tolerance of ± 1 inch.

c. Presence Loop Dimensions for On-Ramps and Off-Ramps. Form presence loops in On-Ramps and Off-Ramps using four turns of wire, making a rectangular 6.5 feet wide and 8 feet long with a tolerance of ± 1 inch.

d. Lead-in Conduit. Place lead-in conduits straight and perpendicular to the centerline of the road from the edge of pavement to the presence loops.

e. Presence Loop Alignment. Center presence detector loops in the traffic lane with a tolerance of ± 1 inch.

f. Presence Loops in Asphalt.

(1) Loop Placement. Locate presence loops 16 feet from leading edge to leading edge unless otherwise noted on the Plans with a tolerance of ± 1 inch. Align presence loops in adjacent lanes within a tolerance of ± 1 inch.

(2) Loops In Existing Asphalt. Rewire presence loops in existing asphalt pavement in place. Use existing presence loop X-bodies located beneath the pavement for access to the loop conduit.

(3) Compaction tests. Compaction test requirements are at the discretion of the Engineer.

(4) Presence Loops In New Asphalt. Install loops in new asphalt pavement just prior to final paving of that section of road. Do not install loops after final lift paving.

g. Presence Loops in Concrete.

(1) Presence Loop Placement. Locate presence loops 20 feet ± 1 inch from leading edge to leading edge unless otherwise noted on the Plans. Align adjacent lane presence loops with a tolerance of ± 1 inch.

(2) Presence Loop-Install Concrete Saw Cutting Do not saw cut for inductive detector loops until the Engineer confirms that the PCC pavement has been ground, straight edged and brought into tolerances.

Place a diagonal cut 6 inches inside each square corner of presence loop slots cut into the PCC pavement. These diagonal cuts allow sharp corners and bends to be avoided

that may damage the presence loop wire.

Use only sawcutting methods approved by the Engineer.

Wash clean, blow out and thoroughly dry slot cuts in the pavement before installing presence loop wire. Fill the saw cut with 3M-epoxy loop sealant or an approved equal after the loop wire is installed.

6. Piezoelectric Sensors.

a. Manufacturer's Recommendations: Install piezoelectric sensors according to AVC equipment and piezoelectric sensor manufacturer's recommendations. The piezoelectric sensor manufacturer's representative, or a piezoelectric sensor manufacturer-certified installation technician must observe and approve piezoelectric sensor installations.

b. Placement Design Adherence. Install the piezoelectric sensors as close as possible to the locations and layouts of conduit runs shown in the Plans.

c. Saw cut Requirement. Install piezoelectric sensors in saw cut slots in final pavement. "Block outs" are not allowed.

d. Coaxial Cable. Run coaxial cables to the equipment cabinet without splices. Terminate on the specified terminal block, with at least 6 feet of slack cable available in the equipment cabinet before to the terminal block.

e. Lead-in Conduit. Install lead-in conduits from edge of pavement to the piezoelectric sensors straight and perpendicular to the centerline of the road. Install and cap lead-in conduits for piezoelectric sensors at the sensor end with tape or sealant before paving. Extend lead-in conduits beyond the edge of the pavement. Complete lead-in conduit runs to junction boxes and cabinets before or after paving.

f. Piezoelectric Sensor Placement. Center each piezoelectric sensor in the travel lanes between that sensor's adjoining inductive loops unless otherwise noted on the Plans or directed by the Engineer. Install piezoelectric sensors with a tolerance of ± 1 inch.

g. Piezoelectric Sensor Replacement In Existing Pavement. Completely eliminate piezoelectric sensors and epoxy to be replaced by saw cutting. Keep saw cuts for piezoelectric sensor removal straight and square. Fill saw cut slots resulting from piezoelectric sensor removal with the same type of epoxy used to install piezoelectric sensors.

Ensure that epoxy patches match the surface of the pavement. Center replacement piezoelectric sensors 1 foot from the original location of removed sensors, offset in the direction opposite of lane traffic flow.

h. Piezoelectric Sensors in New Asphalt. Install piezoelectric sensors in new asphalt pavement only after three days of normal traffic has passed over the final paving.

i. Piezoelectric Sensor Install Concrete Saw Cutting. Do not saw cut the PCC pavement for piezoelectric sensors until the Project Engineer confirms that the PCC pavement has been ground, straight edged and brought into tolerances as provided.

Only use sawcutting methods approved by the Engineer.

Wash and thoroughly dry saw cuts in the pavement before installing piezoelectric sensors.

7. Electronics for ATR Related Equipment.

a. Manufacturer's Representative: Ensure that a manufacturer's representative is present to supervise installation and to commission the equipment as a complete and fully functioning system. Make arrangements to schedule delivery of equipment and to provide for the manufacturer's representative.

b. Definition of Installation Assistance: Ensure that a representative of the system manufacturer (Vendor) is present during the installation of in-road and electronic equipment. The Vendor representative will provide guidance on the proper installation of the equipment and assist in the final system connections, calibration, and acceptance. The vendor field representative shall report directly to the Engineer.

Vendor's Responsibility

As a minimum, the Vendor representative will perform the following tasks on site:

(1) Check equipment before construction to verify proper quantity and type of equipment for site.
(2) Perform pre-installation tests on scales, sensors, or other equipment to verify operation.
(3) Assist in laying out equipment locations before installation.
(4) Observe and provide technical assistance during the installation of in-road equipment.
(5) Provide direction on the installation, splicing, and termination of wiring.

(6) Install system electronics.
(7) Perform electronic installation connections between WIM electronics and termination panel and other system components within the cabinet.
(8) Set system configuration and calibration parameters in system electronics.
(9) Test operation of system components supplied by the manufacturer.
(10) Assist in calibration and acceptance testing by recording measured weights and calculating measures of performance.
(11) Provide operator and maintenance training if required.

Contractor's Responsibility

The Vendor and the Vendor field representative are not responsible for the following items:

(1) Storage, transportation and unloading of equipment.
(2) Providing labor, equipment, tools, or materials required for installation of equipment.
(3) Scheduling of workers or coordination with other work.
(4) Project management or supervision of other workers.
(5) Supply of traffic control, calibration and test vehicles, unless specified.

Requirements for installation assistance will vary from site to site. Factors such as the type of scales or sensors, number of lanes to be installed, layout of equipment, and other components of the system will affect the type and amount of involvement required from the installation representative. The breakdown above presents a general guideline that can be applied specifically to each site as the need arises.

c. Placement of ATR Related Sensors: The placement of the various sensors is critical to achieving the specified accuracy of the ATR system. Field locate ATR related sensors, including inductive loops to within specified tolerances; if necessary by a surveyor.

d. Inductive Loops for ATR Related Equipment.: Cut channels for the loops. Then, place wires directly into the saw cut channels according to the Plans and secure them with epoxy per the manufacturer's recommendations. Place the loops at the depth below the roadway surface as shown in the Plans. Space the 6 feet square loops 16 feet from leading edge to leading edge (10 feet between loops) with a tolerance of $\pm$ 1 inch. Center loops in the traveled way with a tolerance of $\pm$ 1 inch.

e. Acceptance Testing for ATR Related Equipment: Perform acceptance testing to ensure compliance with subsection 669-3.02 Acceptance Testing.

8. Cabinets.

a. Cabinet Placement and Orientation. Install cabinets out of the Clear Zone with the doors facing away from the road.

b. Conduit Entry. Install conduit entries for any above-ground enclosure through the bottom of the enclosure. No conduit runs shall be cut through the sides or top of any above-ground enclosure.

c Style CBA3 Cabinets. Mount style CBA3 cabinets on concrete foundations as shown on the Plans.

9. Utilities.

a. Electrical. Provide and install the Load Center as required according to the Plans, Specifications and the requirements of the appropriate Electrical Utility. Provide and install wiring from the load center to the equipment in the cabinet. Request inspection of the Load Center by the Department of Labor, Division of Mechanical Inspection (DOL/DMI). After approval of the load center by the DOL/DMI, inform the Engineer as to when electrical service is needed at the load center, with sufficient time to enable the HDS to schedule the installation with the Electrical Utility before commissioning of the equipment. The HDS will make arrangements in writing with the Electrical Utility to establish billing accounts. The Electrical Utility will provide service to the Load Center upon request of the Engineer.

b. Asphalt Pavement Roughness: No transverse seams, joints or roughness within 50 feet of any inductive loops placed in asphalt pavement section is allowed. Test the finished surface of the asphalt with a straightedge 10 feet long. Ensure that the surface does not vary more than ¼-inch from the lower edge of the straightedge within 50 feet of all sensors at the ATR installations. At the Engineer's discretion, run a inertial profiler or a profilograph equipped with a chart recorder down each wheelpath of each lane for a distance of 50 feet before and after each ATR installation. HDS will supply the profilograph and the Contractor's personnel will operate it. Ensure that the asphalt surface as recorded by the chart recorder does not vary more than ¼-inch in 10 feet.

c. Field Inspection. Notify the Engineer in writing a minimum of 3 working days in advance (excluding Saturday, Sunday and State or Federal Holidays) before installing conduit/wiring, inductive loops,

bending plate equipment, piezoelectric cable, axle sensors, and cabinets. The Engineer shall be present to approve the installation before final burial or encasement. Correct and allow the Engineer to re-inspect unacceptable installations for completeness before burial or encasement at the Contractor's expense. Uncover, remove, and/or replace installations buried or encased without approval by the Engineer at the Contractor's expense.

669-3.02 ACCEPTANCE TESTING. Perform acceptance testing on all ATR installations.

1. General Tests. Perform tests for the ATR installations according to subsection 660-3.01, Construction Requirements.

2. AVC Acceptance Tests.

   a. Scope and Governance. In addition to the General Tests, perform Acceptance Tests on AVC installations. AVC acceptance tests govern acceptance or rejection of the AVC installation.

   b. Manufacturer Participation. Acceptance tests shall be observed and assisted by the AVC counter manufacturer's representative, or an AVC counter manufacturer-certified installation technician.

   c. Highway Data Section Participation. Before beginning AVC Acceptance Tests, notify the HDS. Notification shall be given in writing, through the Engineer, a minimum of 3 working days before proposed testing (excluding Saturday, Sunday and State or Federal Holidays). Notification shall include descriptions of the proposed test vehicles. A representative of the HDS shall approve descriptions of the proposed test vehicles in writing before testing and be on-site during final acceptance testing. Provide a tabulated listing of each vehicle's gross weight and measured axle spacing to the HDS representative before testing. The HDS representative must approve scheduling of data sampling and testing for each lane.

   d. Results Certification. The Highway Data Manager or designated representative shall certify in writing when the installation has met the accuracy requirements of the acceptance tests.

   Acceptance Test Procedure. Perform the Acceptance Tests as follows:

   Acquire a set of test data for the AVC sensor array. Test data shall be obtained by passing test vehicles over the AVC sensors in each lane. Test data shall consist of 10 valid samples per lane, for each of 3 test

vehicles. Test data samples will include FHWA class designation and computed axle spacing for each sensor pass.

To be considered valid, obtain sample data under the following conditions:

(1) The test vehicle must maintain good lane discipline while traversing the entire sensor array.
(2) The test vehicle must maintain a constant speed, between 40 mph and the maximum truck speed limit of 55 mph, while traversing the entire sensor array.
(3) Acquire all data for a particular lane using the same group of 3 test vehicles.
(4) Sample data from successive sensor passes of each test vehicle. Data may not be omitted or included out of order for any 10 samples.
(5) Sensor passes for the 3 classes of vehicles may be intermixed.
(6) Sensor passes for multiple lanes may be acquired simultaneously.

e. Accuracy Requirements. The Automated Vehicle Classifier must meet the following requirements separately in each lane:

(1) The AVC system correctly assigns FHWA class designation for 9 out of 10 successive sensor passes of each vehicle class.
(2) The AVC system computes axle spacing to within 6 inches of the actual measurements, for 9 out of 10 successive sensor passes of each vehicle class.

f. Test Vehicles. Provide, and make arrangements for test vehicles and drivers as needed for the acceptance testing.

The group of three test vehicles shall consist of one each of the following:

(1) A two axle, six wheel, single unit vehicle (FHWA Class 5)
(2) A three axle, ten wheel, single unit vehicle (FHWA Class 6)
(3) A five axle, eighteen wheel, single trailer vehicle (FHWA Class 9), with high-cube-rated (HCR) trailer

g. Class 5 Vehicles. Class 5 vehicles shall meet the following requirements:

(1) Spacing between steering and drive axles of 13 ft to 23 ft
(2) Weight on the steering axle between 2,000 pounds and 12,000 pounds

(3) Weight on the driving axle between 15,000 pounds and 18,000 pounds

h. Class 6 Vehicles. Class 6 vehicles shall meet the following requirements:

(1) Spacing between steering axle and the drive axle group of 13 feet to 23 feet
(2) Spacing between the drive axles of 4 feet to 6 feet
(3) Weight on the steering axle between 6,000 pounds and 12,000 pounds
(4) Weight on the drive axle group between 20,000 pounds and 37,500 pounds

i. Class 9 Vehicles. Class 9 vehicles shall meet the following requirements:

(1) Spacing between the steering axle and the drive axle group of 13 feet to 23 feet
(2) Spacing between the drive axles of 4 feet to 6 feet
(3) Spacing between the drive axle group and the trailer axle group of 25 feet to 45 feet
(4) Spacing between the trailer axles of 4 feet to 6 feet
(5) Weight on the steering axle between 6,000 pounds and 12,000 pounds
(6) Weight on the trailer axle group between 20,000 pounds and 37,500 pounds

j. Vehicle Loading. Ensure that the test vehicles are loaded with non-shifting material to a minimum of 50 percent of legal load during testing.

k. Tire Inflation. Ensure that all tires on the test vehicles are inflated to recommended pressures during testing.

l. Weighing Method. The gross weight of each test vehicle and the weight of each test vehicle's axle groups shall be determined by weighing on a static scale at a scale house operated by the State of Alaska Division of Measurement Standards & Commercial Vehicle Enforcement (MSCVE).

An axle group is defined as any two axles whose centers are within 8 feet of each other. The Class 5 and Class 6 test vehicles each have two axle groups. The Class 9 single trailer test vehicle has three axle groups.

669-3.04 VENDOR WARRANTY.

1. Period of Performance. The period of performance for this warranty shall be 3 years from the date of issuance of the Certificate of Final Acceptance of the corresponding system by Alaska DOT&PF. The price for this extended warranty will be included in the bid price for each system.

2. Scope. The Vendor will maintain in good working condition, the components of the system. The Vendor shall respond to service or repair malfunctioning equipment within:

   72 hours of notification if there is a serious problem where the system is down and cannot be repaired via telephone support or modem.

   2 weeks of notification if there is a normal problem where the site can be called up and the site is still operational with reduced capability.

   Acknowledge a request to repair malfunctioning equipment within 48 hours of notification.

   The Vendor shall maintain components covered by this contract according to the Department's (ADOT&PF) Specifications for acceptance, accuracy, and tolerances. However, roadway surface conditions are not the responsibility of the Vendor. The roadway surface must be maintained by others to meet specifications.

3. Vendor Services. The Vendor shall provide the following services:

   Scheduled Maintenance Service – The Vendor shall visit each site in April or May to evaluate/assess the condition of the site and provide routine maintenance service on major systems, system components and ancillary equipment. The Vendor shall also visit each site in September/October to service as needed before winter.

   Emergency Repair Service - On an as required basis, the Vendor shall provide repair service for the system. Requests for service shall have a maximum response time as noted in the Scope Section above.

   Operator Refresher Course - In conjunction with the Maintenance Service, the Vendor shall provide "Operator Refresher" courses on the operation of the system. Operator refresher courses are only provided at sorting system installations. The Vendor shall provide a single "Data Collection Refresher" course annually in Anchorage. These instruction courses shall have a maximum duration of 4 hours scheduled immediately before or after the scheduled Maintenance Service. Facilities for refresher courses shall be provided by Alaska DOT & PF.

Software Upgrades - From time to time the Vendor may release new versions of software. When these are released, the software upgrade shall be offered to the DOT&PF at no extra cost. Any hardware upgrades, improvements, or changes, required to facilitate new software or additional features are not included.

Verify System Calibration - The inspection will verify system and interface operation. Calibration will be performed once per year with calibration vehicles supplied by the DOT&PF, or at the option of the Department by the Vendor, as an extra to this contract.

4. Scheduled Maintenance Service. General: The Vendor's preventative maintenance service performed in the spring and fall of each year shall include the following:

a. In-Road Instrumentation:

Test signal level and lead cable of in-road sensors and scales. Repair or replace as required.

Maintain installation of grout and sealant. Repair or replace as required.

Perform visual inspection of detector housings.

b. Electronics Interface and System Computers:

Clean interior and exterior of ATR electronics, power supplies and modems. Repair or replace as required.

Maintain ATR cables and connectors, terminal strips, and back-up batteries. Repair or replace as required.

Maintain electrical connectors, cables and components. Test and visually inspect utility pole, AC disconnect box, main AC circuit breakers, cabinet AC circuit breakers, and AC outlets.

Perform visual inspection of equipment cabinet. Repair or replace as required.

Test and visually inspect cabinet heater, ventilation fan and filter, thermostat, light and fused switch. Repair or replace as required.

Verify control and sequence of operation of interface components

c. Contract Limitations: Repairs and/or replacement of equipment when defect(s) result(s) from one or more of the following causes:

Exposure to severe environmental conditions, including direct lightning hit, flooding, explosion, fire, accidents, pavement movement, pavement deterioration, or acts of God;

Alteration, repair or overhaul by persons not authorized by the Vendor;

Operation, maintenance or modification which is not in accordance with the Vendor's instructions.

d. Traffic Control When lane closures are required, these shall be provided by the Vendor. Whenever possible, the work covered by this contract, or work requiring lane closure shall be scheduled during normal work days and during light hours.

669-3.05 DELIVERABLES. Deliverables shall be submitted to the HDS before final approval of the work or as otherwise called for herein.

1. Materials Submittal.

   a. Format and Contents. Provide a Materials Submittal of proposed equipment and materials for the ATR installations. The Materials Submittal shall consist of three collated copies of an equipment and materials portfolio. Each identical portfolio shall contain information of sufficient detail to determine the suitability of the equipment and materials proposed.

   b. Table of Contents. Each portfolio shall include a table of contents listing each item's intended uses, item description, product name, manufacturer, model or part number and reference to associated information within the portfolio.

   c. Reference Drawings. The Materials Submittal shall include a detailed shop drawing of each equipment cabinet showing the location of all mounted components.

   d. Delivery Interval. The Materials Submittal shall be delivered for review and approval of the Highway Data Supervisor within thirty days following award of the contract.

   e. Liability. The State of Alaska will not be liable for any materials purchased, labor performed, equipment used or delay to the work before all equipment and materials have been reviewed and approved.

2. Utility Schedule.

Provide a Utility Schedule identifying all actions required ensuring activation of electrical and telephone service prior to installation and commissioning of ATR equipment at affected sites. The Utility Schedule shall consist of three collated copies of the lists of action items.
A separate list of chronologically and sequentially organized actions will be created for each affected ATR station.

On the lists, each action item shall include:

a. A description of the action
b. When the action will occur
c. The name, employer, position title and telephone number of the point of contact for initiating the action
d. The name, employer, position title and telephone number of the party responsible for completing the action.

The Utility Schedule shall be delivered for review and approval of the Highway Data Supervisor within thirty days following award of the contract.

3. As-Built Plans.

Prepare four complete sets of as-built plans that will be current with the construction. These as-built plans shall detail all construction changes made to the ATR design and include the following information on the appropriate sheets:

a. Location and depth of inductive loops, piezo sensors, conduit runs and scales.
b. Locations of equipment cabinets and junction boxes.
c. Station and offset of junction boxes

Three sets of as-built plans shall be presented to the Engineer, and one set shall be affixed to the inside of the cabinet door at the appropriate Automated Traffic Recorder Installation in a waterproof, clear plastic holder.

Redlines of full size construction plans will be acceptable as-builts.

4. Photographs.

Provide photographic prints, 35 mm negatives and Kodak Picture CD format CD ROMs documenting sensor installations.

Photographs, negatives and CD ROMs shall be delivered organized in one or more white colored, D-ring style, 3 ring binders with clear insert overlays on fronts and spines. Photographs and negatives will be mounted in archival quality polypropylene pocketed sheets. CD ROMs will be placed in CD storage sheets inside the binders.

The photographs shall be 5" x 7" color prints.

Each photograph shall be labeled with the identification of its subject. ATR station and device designation as indicated on the Plans will be used as identification whenever possible (example: H1 - W1NLA). Labels will be photographed with the subject and will be rendered large enough to be read with the unaided eye.

The photographs shall show the inductive loops and conduit in place before covering with gravel and pavement for asphalt pavement sites, or before covering with epoxy compound for concrete pavement sites. The photographs shall include:

Two or more overall views of each ATR installation showing placement of the inductive loops.

One or more views of each loop showing the loop and the conduit to the nearest junction box.

One or more views of each piezo sensor conduit showing the coaxial cable, saw cut, and conduit to the nearest junction box.

One or more views of each temperature sensor showing the lead cables, saw cut, and conduit to the nearest junction box.

5. Test Results. Written or printed copies of the final results of tests, signed by the Contractor, shall be provided to the Engineer before acceptance of the Automated Traffic Recorder Installation.

6. Manuals. Provide to the Highway Data Manager installation, repair and operation manuals for Automated Traffic Recording equipment supplied under this project.

7. Materials. Provide to the Highway Data Manager ATR equipment, sensors and epoxy grout remaining after installation.

Palletize the Deliverable Materials.

Group the contents of each pallet by like items.

Attach to each pallet a sealed plastic pouch containing complete copies of Material Safety Data Sheets that apply to the contents of that pallet.

Provide an itemized list of Deliverable Materials. For each item, the list shall detail:

a. Item description: including nature of the item, brand name, manufacturer name, model number, type number and serial number.
b. Item condition
c. Item quantity

Provide complete copies of all Material Safety Data Sheets that apply to the Deliverable Materials. Attach these Material Safety Data Sheets after the last page of the Deliverable Materials list.

669-4.01 METHOD OF MEASUREMENT. Items 669(1A) through 669(1D) will not be measured.

669-5.01 BASIS OF PAYMENT. Items 669(1A) through 669(1D). The contract lump sum price for all Automatic Vehicle Identification System installations shall be full compensation for furnishing equipment, labor and subsidiary materials necessary to complete the work as specified. No separate payment will be made for excavation and backfill materials, sawcutting, asphalt concrete pavement, STE-1 tack coat, portland cement concrete, as-built plans, providing the manufacturer's representative, vendor warranty, acceptance testing, j-boxes, conduit trench, warning tape, or rigid conduit. These items and any other miscellaneous items will be considered subsidiary to the AVI system .

The installation of wiring and service to the Load Center(s) will be paid for under The Utility Agreement for Electrical Service. Installation of wiring and Service to the Network Interface Device(s) (NIDs) will be paid for under the Utility Agreement for Telephone Service.

WITHHOLDING. To ensure full compliance under this Section, 20 percent of the billings for each Section 669(1) item shall be withheld until all deliverables have been provided to the Engineer as required and approval of the deliverables by the HDS has been received in writing.

Payment will be made under:

Pay Item No.	Pay Item	Pay Unit
669(1A)	Automatic Vehicle Identification System Complete, Glenn Highway Northbound	Lump Sum
669(1B)	Automatic Vehicle Identification System Complete, Glenn Highway Southbound	Lump Sum
669(1C)	Automatic Vehicle Identification System Complete, Ocean Dock Road	Lump Sum
669(1D)	Automatic Vehicle Identification System Complete, Seward Highway	Lump Sum

SECTION 730

SIGN MATERIALS

Special Provisions

730-2.04 SIGN POSTS. Add the following item:

7. Structural Tubing and W-Shape Beams.

   a. Structural tubing shall conform to either 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.

   e. 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.

(06/22/04)R81USC04

SECTION 740

SIGNALS AND LIGHTING MATERIALS

Special Provisions

Replace subsection 740-2.02 with the following:

740-2.02 SIGNAL AND LIGHTING POLES. Design and fabricate camera, antennae and OVDS structures with pole shaft lengths to 55 feet long to conform to the 1994 Edition of AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* with interim revisions.

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 stresses on the completed structure with hardware in place.

Design Requirements

1. 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.

2. On the stamped shop drawings, provide design wind speed and the details for building the poles and mast arms, including: materials specifications, slip fit joint dimensions, pole component dimensions, welds that will be made, and the welding inspection that will be done.

Submit the mill certifications for the steel items (piles, plates, bolts, and other related items) to the Engineer for approval.

Design poles for 100 mph winds with a 1.3 gust factor.

Design each OVDS pole to support a transmitter/receiver with an area of 5.0 square feet, a dead load of 150 pounds, and having its centroid located 16 feet above the base of the pole.

Fabricate camera and antenna structures from tapered steel tubes with a round cross section. Orient hand holes located near the base of poles to face down stream of traffic flow.

Fabricate OVDS structures from non tapered steel tubes with a round cross section. Orient hand holes located near the base of poles to face down stream 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 a minimum overlap of two feet or 1.5 times the inside diameter of the female section whichever is larger. 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 six-inches above the top of the signal mast arm connection.

Fabricate tubes with walls up to ½-inch thick from the prequalified base metals listed in AWS D1.1 and feature maximum yield strengths of 70,000-psi. Fabricate elements greater than ½-inch thick from steel that conforms to ASTM A 709 and meets the Fracture Critical Impact Test requirements for zone 3. The Department will not accept structures that contain or are made with laminated steel elements.

Fabricate 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.

Fabricate 10 feet long posts from 11 US Standard Gage sheet steel. Fabricate each post with a minimum inside diameter of five inches at the base plate. Use a 3½-inch long piece of four-inch nominal Schedule 40 pipe that conforms to ASTM A 53 Grade B as a post-top adapter.

The Department does not allow holes made for lifting purposes in the ends of tubular segments. 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 may be left in place.

Hot-dip galvanize camera, antenna, and OVDS structures to meet AASHTO M 111 and these specifications. Completely submerge pole and mast arm segments in one dip in a kettle of concentrated zinc ammonium chloride flux solution heated to 130°F, then completely submerge in one dip in a separate kettle of prime western grade zinc heated to approximately 825°F. Galvanize bolts and fasteners to meet AASHTO M 232.

After the poles and mast arms are galvanized, remove excess zinc from drip lines and points and the surfaces of tube ends that form slip type joints to provide a smooth finish.

Pole Rejection

The Department will reject poles and mast arms that are:

1. Not fabricated according to these specifications or the approved shop drawings,

2. Bowed with sweeps exceeding ¾ inch throughout the length of the pole, mast arm, or segment, if a two-piece pole or mast arm is furnished,

3. Out of round. Sections are out of round when the diameters of round members or the dimension across the flats of multi-sided members exceed two percent of the dimension specified on the shop drawings.

Fabricate pile cap adapters from grade X42 steel line pipe that conforms to API 5L and from steel plate that conforms to ASTM A 709 Grade 50. Attach the anchor plate to the pile section with a complete joint penetration (CJP) weld. Fabricate the anchor plate to match the base plate of the lighting standard.

Welding Requirements

Perform welding to conform to subsection 504-3.01 8. Welding and the following:

1. Make welds continuous.

2. Use partial joint penetration (PJP) welds in longitudinal seams. PJP welds must provide at least 60 percent penetration.

3. Use CJP groove welds to connect base plates to tubes with walls 5/16 inch thick and thicker. When CJP groove welds are used, use additional fillet welds when deemed necessary.

4. Use socket-type joints with two fillet welds to connect base plates to tubes with walls less than 5/16 of an inch thick.

5. On steels 5/16 of an inch thick and thicker, inspect 100 Percent of CJP welds by either radiography (RT) or ultrasound (UT).

6. Inspect a random 25 percent of PJP and fillet welds by magnetic particle (MT). If a defect is found, inspect 100 percent of the PJP and fillet welds made to fill the order. In steels less than 1/8 inch thick, complete the tests per AWS D1.3.

Pole and Mast Arm Requirements

Finish the edges of poles and mast arms to conform to the following requirements. Before they are hot dip galvanized, neatly round the following features to the radius specified:

1. On holes through which electrical conductors pass, provide a 1/16-inch radius on both the entrance and exit edges,

2. On pole base plates, provide a 1/8-inch radius on edges along which plate thickness is measured and a smooth finish on other exposed edges,

3. 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 six inches, do two things: a) grind down welds until they feature a radius concentric with the mating surface and b) remove material protruding from the two surfaces, and

4. Grind exposed welds flush with the base metal, except fillet welds and seam welds on top of mast arms. Grinding seam welds on multi-sided poles is not required, except in slip type joints.

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 all required information using ¼ 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 under side of mast arms. If a two-piece antenna and signal mast arm with a slip type joint is furnished, mark both pieces with the same message.

TABLE 740-1 POLE MARKINGS		
Note: *Italic type indicates additional Tag Markings if poles have 2 luminaire or 2 signal mast arms.*		
	MEASUREMENTS	**TAG MARKINGS**
Signal Poles		
a) Signal mast arm length	45 ft./*55 ft.*	SMA 45/*SMA 55*
b) Luminaire mast arm length	22 ft./*18 ft.*	LMA 22/*LMA 18*
c) Pole height	36 ft.	PH 36
d) Intersection number (if more than one) -pole number		1 - P 4
e) Sum of signal mast arm moments about centerline of signal pole		SM 4000/*SM 3200*
f) Design wind speed	100 mph	DWS 100
Light Poles		
a) Luminaire mast arm length	15 ft./*15 ft.*	LMA 15/*LMA 15*
b) Pole height	37 ft.	PH 37
OVDS and Camera Poles		
a) Pole height	25 ft.	PH 25
b) Design wind speed	100 mph	DWS 100
Antenna Poles		
a) Antenna mast arm length	45 ft./*55 ft.*	AMA 45/A*MA 55*
b) Pole height	22 ft.	PH 22
c) Design wind speed	100 mph	DWS 100
Signal Mast Arm		
a) Mast arm length	40 ft.	SMA 40
b) Intersection number (if more than one) -pole number		1 - P 4
c) Sum of signal mast arm moments about centerline of signal pole		SM 3740
d) Design wind speed	100 mph	DWS 100
Antenna Mast Arm		
a) Mast arm length	40 ft.	AMA 40
b) Design wind speed	100 mph	DWS 100
Luminaire Mast Arm		
a) Mast arm length	18 ft.	LMA 18
b) Pole number (if unique arm design)		P 4

Replace subsection 740-2.06 with the following:

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 that conform to UL-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-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 651 B.

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 ¾-inch, angular misalignments in any direction to 30 degrees, and parallel misalignment of the conduits to ¾-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.