

SECTION 01 11 13
WORK COVERED BY CONTRACT DOCUMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Work Covered by Contract Documents
- B. Description of Bid Items
- C. Contract Method
- D. Work By Others
- E. Shutoffs, Disruptions to Service
- F. Contractor's Use of Premises
- G. Coordination
- H. Access for Testing and Inspection

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1. Work under this Contract comprises construction of a new bulk fuel tank farm, complete with gravel pad foundation and lined concrete dike secondary containment system, all associated dispensing, piping, and electrical work required for a complete fuel system in the community of Tatitlek, Alaska in accordance with the contract drawings and specifications.
2. **Basic Bid** – Provide all labor, materials and equipment required to construct Bid Schedule A as described in Section 1.3.1 Description of Bid Items below.
3. **Additive Alternates** – Provide all labor, materials and equipment required to construct Additive Alternates as described in Section 1.3.2 Description of Bid Items below.

1.3 DESCRIPTION OF BID ITEMS

1.3.1 Schedule A – Community Bulk Fuel Upgrades

- A. Bid Item A1: Mobilization/Demobilization
 1. The unit price Bid for Mobilization/Demobilization shall include all mobilization and demobilization costs associated with construction of the basic bid items described in Bid Schedule A and must include the following principal items performed or established in accordance with the Contract

Documents:

- a. Pre-construction and post-construction costs of obtaining all required bonds, insurance, and permits, and other costs Contractor must incur before beginning the Work.
 - b. Transportation of all materials, supplies, plant(s), equipment and personnel to and from the jobsite.
 - c. Erecting and maintaining all plants, temporary structures, storage yards erosion control measures, and other construction facilities, and for Work required to remove said temporary facilities and perform cleanup of the project area in accordance with Section 01 50 00 Construction Facilities and Temporary Controls and Section 01 57 13 Temporary Erosion and Sediment Control.
 - d. Obtaining and paying for all permits required of the Contractor.
 - e. Posting all OSHA-required notices and establishing safety programs.
 - f. Submittal of required Project Schedules.
2. Transportation of Authority provided bulk fuel tank, catwalk, and ladder from their current location to the jobsite. Tanks and locations are as follows:
- a. One (1) 11,600-gallon nominal capacity, UL 2085 listed, horizontal, protected, skid mounted, above grade dual product dispensing tank located at:

Alaska Energy Authority (Shop)
2601 Commercial Drive
Anchorage, Alaska 99501
3. Mobilization/Demobilization costs for all subcontracted work shall be considered to be included.
4. Items which are not to be included in this item include:
- a. Any portion of the Work covered by specific Bid item or incidental work which is to be included in a Bid item or items.
 - b. Profit, Interest on borrowed money, overhead or management costs.
5. Method of Measurement: Payment for mobilization and demobilization will be made in partial payments as follows:
- a. Up to 60% of the amount bid for mobilization and demobilization may be paid when equipment and supplies are landed in serviceable condition at the project site and other necessary

preparations have been completed so that work can commence on Bid Schedule A bid items.

- b. The remaining balance will be paid as Contractor facilities are dismantled and equipment is removed from the project site, with the final increment paid upon completion of demobilization. The owner reserves the right to require Contractor to submit invoices, payroll records, and other appropriate documentation to substantiate any or all payments under this item.

6. Basis of Payment: Payment will be made at the Contract Lump Sum price for mobilization / demobilization.

B. Bid Item A2: Tank Farm Civil Site Work

1. The unit price Bid for Community Tank Farm Civil Site Work shall include full payment for all labor, material, transportation, freight, and equipment required to:
 - a. Complete earthwork related to the tank farm: Activities to complete this task include, all clearing, grubbing, overburden disposal, dewatering, surface preparation, stockpiling, geotextile installation, excavation, soil thawing, erosion control, culverts, drainage structures and procurement, transportation, placement, compaction and finish grading of classified fill as required to construct foundation pads, access drives, and laydown areas for the bulk fuel tank farm, retail dispenser and related facilities, in accordance with the Contract Drawings and Specifications.
2. Items which are not to be included in this bid item are listed below:
 - a. Any portion of the Work covered by separate Bid item or incidental work.
 - b. Fence, concrete containment dikes, tank farm membrane liner systems and classified fill within containment dikes.
3. Measurement for payment shall be lump sum complete in-place.

C. Bid Item A3: Bulk Fuel Tank Farm and Dispenser.

1. The unit price Bid for the Community Bulk Fuel Tank Farm shall include full payment for all labor, material transportation, freight, and equipment required to:
 - a. Construct concrete dike wall secondary containment: Activities to complete this task include, furnishing and installing cast-in-place concrete, concrete reinforcement, geotextile, liner, liner cover, fence, warning signs and information placards, extinguishers, drainage piping and sumps, and procurement, transportation, placement, compaction and finish grading of classified fill as

required to construct a fully functional concrete dike wall secondary containment structure in accordance with the Contract Drawings and Specifications.

- b. Install tanks, tank foundations, mechanical and electrical equipment: Activities to complete this task include, transporting and installing one (1) 11,600-gallon nominal capacity, owner provided, horizontal, dual product dispensing tank, furnishing and installing all required venting, gauging, water draw and pressure relief appurtenances, tank foundation systems, all associated pumps, piping, fuel header, valves, fittings, meters, tags, light/utility poles, lighting, and electrical and mechanical controls in accordance with the Contract Drawings and Specifications.
 - c. Furnish and Install retail dispensing sales system: POS system, remote card reader and two product electronic retail dispenser shall be an interfacing, secure, and fully operational system, certified for public fuel sale operations. Install system with all required appurtenances, cords, hardware, and software to be complete and fully functional. Install POS components in the new Corporation fuel sales office located at the old clinic building (approximately 850-feet northwest of the dispenser). Install all required conductors, poles, and radio link between dispenser and fuel sales office in accordance with the Contract Drawings and Specifications.
 - d. Transfer Fuel & Decommission Existing Tanks: Activities to complete this task include filtering and transferring all usable product from the existing 2,000 gallon & 10,000 gallon tanks to the new tank farm or to tank(s) in the community as directed by the Owner. Remove transfer pump and fill port from existing 2,000 gallon tank and plug openings with liquid tight bungs. Label both tanks as "Out of Service".
2. Measurement for payment shall be lump sum complete in-place.
- D. Bid Item A4: Spill Response Equipment
1. The unit price Bid for Spill Response Equipment shall include but not be limited to full payment for all labor, material and equipment required to:
 - a. Provide spill response gear within new connex van: Activities to complete this task include, the procurement of an 8-ft by 20-ft, new weather-tight connex van and all required spill response equipment listed in the Contract Documents, packaging of the spill response equipment within the connex van, delivery, construction of shelving, connex foundation, deck, stairs, installation of lighting, and placement of the filled connex van in accordance with the Contract Drawings and Specifications.
 2. Measurement for payment shall be lump sum complete in-place

1.3.2 Additive Alternates – Tank Disposal

- A. Additive Alternate 1 – 2,000 Gallon Concrete Tank Disposal
 - 1. The unit price Bid for 2,000 Gallon Concrete Fuel Tank Disposal shall include full payment for all labor, material transportation, freight, and equipment required to:
 - a. Take Ownership of and remove the tank taken out of service by this project, including all unusable contents, from the community. Dispose of any remaining sludge or liquids IAW all applicable rules and regulations.
- B. Additive Alternate 2 – 10,000 Gallon Double Wall Tank Disposal:
 - 1. The unit price Bid for 10,000 Gallon Double Wall Tank Disposal shall include full payment for all labor, material transportation, freight, and equipment required to:
 - a. Take Ownership of the tank and remove it and all unusable contents from the community. Dispose of any remaining sludge or liquids IAW all applicable rules and regulations.

1.4 CONTRACT METHOD

- A. This contract is composed of lump sum and unit bid items as shown on the bid schedule.

1.5 WORK BY OTHERS

- A. Other projects may run concurrently with the work. Cooperate with other contractors, force account construction crews and superintendents, agencies and the Owner to minimize conflicts.
- B. Notify the Engineer immediately if conflicts will interfere with the progress of the work.

1.6 SHUTOFFS / DISRUPTIONS TO SERVICE

- A. No disruptions in fuel supply or electric power generation will be allowed.
- B. Work with the Owner to schedule any other disruptions for a time which minimizes impact on facility operations. Provide not less than 72 hours notice to Owner of activities that will affect Owner operations.

1.7 CONTRACTOR'S USE OF PREMISES

- A. Coordinate with Owner prior to placing equipment or supplies at the staging area(s) identified on the Contract Drawings. Do not disturb areas outside of project

boundaries.

- B. Do not disrupt access to adjacent areas unaffected by the Work. Keep driveways and entrances serving premises clear and available for use at all times. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner operations.
- C. Assume full responsibility for protection and safekeeping of products under this Contract.
- D. Assume full responsibility for the protection of existing facilities and contents, from damage due to construction operations.

1.8 COORDINATION

- A. Coordinate Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
- B. Sequence Work to maximize worker efficiency and minimize construction time.
- C. Prior to procurement verify that characteristics of interrelated equipment are compatible.
- D. Coordinate space requirements and installation of components. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

1.9 ACCESS FOR TESTING AND INSPECTION

- A. Provide access for Owner and Engineer to the site. Provide on-site transportation, ladders, lifts, eye and ear protection, hard hats, appropriate and clean respiratory protection, etc., for inspections and testing of the work.

PART 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 11 17

INTENT OF DOCUMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Explanation of intent and terminology of the Construction Documents.

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 General Conditions: Article 1 Definitions relating to 'Drawings' and 'Specifications'.
- B. Section 00 70 00 General Conditions: Article 3 Contract Documents relating to Intent, Amending, and Reuse.

1.3 SPECIFICATION FORMAT AND COMPOSITION

- A. Specifications are divided into Divisions and Sections for the convenience of writing and using. Titles are not intended to imply a particular trade jurisdiction. AUTHORITY is not bound to define the limits of any subcontract, and will not enter into disputes between the CONTRACTOR and his employees, including Subcontractors.
- B. Pages are numbered independently for each section, and recorded in the Table of Contents. Section number is shown with the page number at the bottom of each page. The end of each section of the specifications is ended by "End of Section". It is Contractor's responsibility to verify that Contract Documents received for bidding and/or construction are complete in accordance with Table of Contents.
- C. The language employed in the Contract Documents is addressed directly to the CONTRACTOR. Imperative or indicative language is generally employed throughout and requirements expressed are the mandatory responsibility of the CONTRACTOR, even though the work specified may be accomplished by specialty subcontractors engaged by the CONTRACTOR. References to third parties in this regard shall not be interpreted in any way as to relieve the CONTRACTOR of his or her responsibility under this Contract.
- D. These Specifications are of the abbreviated, or "streamlined" type, and may include incomplete sentences.
- E. Omissions of words or phrases such as "the Contractor shall", "in conformity therewith", "shall be", "as noted on the Drawings", "according to the Drawings", "a", "an", "the", and "all" are intentional.
- F. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

1.4 DRAWINGS: CONTENT EXPLANATION

- A. Drawings, Dimensions, and Measurements.

1. Contract Documents do not purport to describe in detail, absolute and complete construction information. Drawings are diagrammatic. Contractor shall provide verification of actual site conditions and shall provide complete and operational systems as specified when drawings do not provide full detail.

1.5 COMMON TERMINOLOGY

- A. Certain items used generally throughout the Specifications and Drawings are used as follows:

1. Indicated: The term "indicated" is a cross reference to details, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", "schedules", and "specified" are used in lieu of "indicate", it is for the purpose of helping the reader accomplish the cross reference, and no limitation of location is intended except as specifically noted.
2. Installer: The person or entity engaged by CONTRACTOR, his Subcontractor or sub-subcontractor for the performance of a particular unit of Work at the Project site, including installation, erection, application and similar required operations. It is a general requirement that installers be recognized experts in the work they are engaged to perform.
3. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean "...supply and deliver to the Project site, ready for unpacking, assembly and installation..."
4. Provide: Except to the extent further defined, the term "provide" means to furnish and install, complete and ready for the intended use.
5. Guarantee and Warranty: "Warranty" is generally used in conjunction with products manufactured or fabricated away from the Project site, and "guarantee" is generally used in conjunction with units of work which require both products and substantial amounts of labor at the Project site. The resulting difference is that warranties are frequently issued by manufacturers, and guarantees are generally issued by CONTRACTOR and frequently supported (partially) by product warranties from manufacturers.

1.6 CONFLICTS

- A. Report any conflicts to the Project Manager for clarification.

PART 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 11 21

CONTRACTOR'S CERTIFICATION OF SUBCONTRACTORS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for preparing, submitting, and accepting subcontracts.

1.2 RELATED REQUIREMENTS

- A. Document 00 10 00 Information to Bidders
- B. Document 00 43 00 Subcontractor List
- C. Document 00 70 00 General Conditions
- D. Section 01 33 00 Submittals: Procedures

1.3 PREPARATION

- A. Certification Forms: Use forms provided by AUTHORITY.
- B. CONTRACTOR to prepare certification form and submit to the AUTHORITY prior to the start of work. Multiple subcontracts may be included under a single submittal. Where required, attach additional information (cross-referenced to the appropriate subcontract) to the certification form.
- C. Substitute certification forms will not be considered.

1.4 SUBMITTAL OF CERTIFICATION

- A. CONTRACTOR shall submit the initial and all subsequent certification forms in accordance with the submittal requirements identified under paragraph 1.02 D of this Section.

1.5 CONSIDERATION OF CERTIFICATION

- A. Following receipt of submittal and within a reasonable period of time AUTHORITY shall review for each of the following:
 - 1. Completeness of forms and attachments.
 - 2. Proper execution (signatures) of forms and attachments.
- B. Submittals which are not complete or not properly executed will be returned to the CONTRACTOR under a transmittal letter denoting the deficiencies found. CONTRACTOR shall correct and resubmit per paragraph 1.4 of this Section.
 - 1. Subcontractors will be required to leave the project site until properly executed subcontract is in place.

2. Payment will not be made for work performed by a non-certified subcontractor.

1.6 ACKNOWLEDGMENT OF CERTIFICATION

- A. Submittals which have been examined by AUTHORITY and are determined to be complete and properly executed shall be acknowledged as such by signature of designated AUTHORITY representative on the face of each certification form.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 20 13

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for preparation and submittal of Applications for Payment.

1.2 RELATED REQUIREMENTS

- A. Section 00 72 13 General Conditions
- B. Section 01 33 00 Submittal
- C. Section 01 29 73 Schedule of Values
- D. Section 01 77 19 Closeout Requirements
- E. Section 01 78 39 Project Record Documents

1.3 FORMAT

- A. Application for Payment form as provided by AUTHORITY or Contractor's form containing same information.

1.4 PREPARATION OF APPLICATIONS

- A. Type required information on Application for Payment form approved by AUTHORITY.
- B. Execute certification by original signature of authorized officer upon each copy of the Application for Payment.
- C. Submit names of individuals authorized to be responsible for information submitted on Application for Payment.
- D. Indicate breakdown of costs for each item of the Work on accepted schedule of values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
- E. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
- F. Include 10% retainage on each pay request. Retainage shall be eligible for payment on Contractor's final pay request.
- G. Prepare Application for Final Payment as specified in Section 01 77 19 Closeout Requirements.

1.5 SUBMITTAL PROCEDURES

- A. Submit one copy of each Application for Payment at times stipulated in Contract.

- B. Submit under AUTHORITY accepted transmittal letter. See Section 01 29 73 Schedule of Values. Identify Contract by the AUTHORITY contract number.

1.6 SUBSTANTIATING DATA

- A. When AUTHORITY requires substantiating information, submit data justifying line item amounts in question.
- B. Provide one copy of data with cover letter for each copy of Application for Payment. Show Application for Payment number and date, and line item by number and description.

1.7 SUBMITTALS WITH APPLICATION FOR PAYMENT

- A. Submit the following with each Application for Payment.
 - 1. Updated construction schedule as required by Section 01 33 00 Submittals.
 - 2. Updated Schedule of Values as required by Section 01 29 73 Schedule of Values.
 - 3. Evidence of transmittal of certified payrolls, if required, to the Labor Department.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 25 13

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Requests for substitution of products.

1.2 RELATED REQUIREMENTS

- A. Section 00 02 00 Invitation For Bids: Substantial Completion Date.
- B. Section 00 70 00 General Conditions
- C. Section 00 80 00 Supplementary Conditions
- D. Section 01 33 00 Submittals
- E. Section 01 33 23 Shop Drawings, Product Data, and Samples

1.3 SUBSTITUTION SUBMITTAL PERIOD

- A. All product substitution requests will be considered only within 15 days after date established in Notice to Proceed. Subsequent requests will be considered only in case of product unavailability or other conditions beyond control of CONTRACTOR. (Submit on Substitution Request Form approved by Project Manager)

1.4 OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.
- C. Products Specified by Naming One or More Manufacturers followed by the term "No Substitutions": use only specified manufacturers, no substitutions allowed.

1.5 PRODUCTS LIST

- A. Within (15) days after date of Notice to Proceed, transmit an electronic copy of a list of products which are proposed for installation, including name of manufacturer.
- B. Tabulate products by Specifications section number, title, and Article number
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- D. AUTHORITY will reply in writing within fifteen days stating whether there is

reasonable objection to listed items. Failure to object to a listed item shall not constitute a waiver of requirements of Contract Documents.

- E. AUTHORITY will contact Engineer to ascertain any extra Professional fees to assess the substitutions and shall so notify CONTRACTOR who will include payment for the professional review cost in the application for substitution.

1.6 LIMITATIONS ON SUBSTITUTIONS

- A. Substitutions will not be considered when indicated on Shop Drawings or product data submittals.
- B. Substitute products shall not be ordered or installed without written acceptance.
- C. AUTHORITY will contact the Engineer to determine acceptability of substitutions.

1.7 REQUESTS FOR SUBSTITUTIONS

- A. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.
- B. Identify product by Specification section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and Suppliers as appropriate.
- C. Attach product data as specified in Section 01 33 23.
- D. List similar projects using product, dates of installation, and names of design Engineer(s) and, name of the facility owner.
- E. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specification sections and Article numbers.
- F. Give quality and performance comparison between proposed substitution and the specified product.
- G. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Price.
- H. List availability of maintenance services and replacement materials.
- I. State effect of substitution on construction schedule, and changes required in other Work or products.

1.8 CONTRACTOR REPRESENTATION

- A. Request for substitution constitutes a representation that CONTRACTOR has investigated proposed product and has determined that it is equal to or superior in all respects to specified product.
- B. CONTRACTOR will provide same warranty for substitution as for specified product.
- C. CONTRACTOR will coordinate installation of accepted substitute, making such

changes as may be required for Work to be complete in all respects.

- D. CONTRACTOR certifies that cost data presented is complete and includes all related costs under this Contract.
- E. CONTRACTOR waives claims for additional costs related to substitution which may later become apparent.

1.9 SUBMITTAL PROCEDURES

- A. Submit an electronic copy of complete request for substitution.
- B. Project Manager will review CONTRACTOR's requests for substitutions with reasonable promptness.
- C. During the bidding period, AUTHORITY will record acceptable substitutions in Addenda.
- D. After Award of Contract, AUTHORITY will notify CONTRACTOR, in writing, of decision to accept or reject requested substitution within 15 days.
- E. For accepted products, submit Shop Drawings, product data, and samples under provisions of Section 01 33 23.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 26 57
CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for processing Change Orders.Á

1.2 RELATED REQUIREMENTS

- A. Section 00 HG €€ Bid Schedule.Á
- B. Section 00 5F €€ Construction Contract: Total amount of Contract Price, as awarded.Á
- C. Section 00 70 00 General Conditions:
- D. Section 01 2J 13 Application for Payment.Á
- E. Section 01 33 00 Submittals: Progress Schedules.Á
- F. Section 01 29 73 Schedule of Values.Á
- G. Section 01 77 19 Closeout Requirements.Á

1.3 SUBMITTALS

- A. Submit name of the individual authorized to accept changes, and to be responsible for informing others in C's employ of changes in the Work.Á
- B. Change Order forms will be prepared by AUTHORITY.Á

1.4 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

- A. Maintain detailed records of work done on a Cost of the Work basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work. Incomplete or unsubstantiated costs will be disallowed.Á
- B. CONTRACTOR shall submit a complete, detailed, itemized cost breakdown addressing impact on Contract Time and Contract Price with each proposal.Á
- C. On request, provide additional data to support computations:Á
 - 1. Quantities of products, labor, and equipment.Á
 - 2. Taxes, insurance, and bonds.Á
 - 3. Justification for any change in Contract Time.Á
 - 4. Credit for deletions from Contract, similarly documented.Á

- D. Support each claim for additional costs, and for work done on a Cost of the Work basis, with additional information:
 - 1. Origin and date of claim.
 - 2. Dates and times work was performed and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.5 PRELIMINARY PROCEDURES

- A. AUTHORITY may submit a Proposal Request which includes: Detailed description of change with supplementary or revised Drawings and Specifications, the projected time for executing the change, with a stipulation of any overtime work required, and the period of time during which the requested price will be considered valid.
- B. CONTRACTOR may initiate a change by submittal of a request to AUTHORITY describing the proposed change with a statement of the reason for the change, and the effect on Contract Price and Contract Time with full documentation.

1.6 CONSTRUCTION CHANGE AUTHORIZATION

- A. Shall be in accordance with Article 9 - Changes: in Section 00 70 00 - General Conditions.

1.7 LUMP SUM CHANGE ORDER

- A. CONTRACTOR shall submit an itemized price proposal in sufficient detail to fully explain the basis for the proposal. CONTRACTOR and AUTHORITY shall then negotiate an equitable price (and time adjustment if appropriate) in good faith. The Change Order will reflect the results of those negotiations. If negotiations break down, CONTRACTOR may be directed to perform the subject Work under a COST OF THE WORK CHANGE ORDER.
- B. The maximum rates of cost markup (to cover both overhead and profit of the CONTRACTOR) shall be in accordance with Article 10- Contract Price, Computation and Change: in Section 00 70 00 – General Conditions.
- C. These terms shall also apply to the proposals of subcontracts and allowances.

1.8 UNIT PRICE CHANGE ORDER

- A. For pre-determined unit prices and quantities, Change Order will be executed on a lump sum basis.
- B. For pre-determined unit prices and undetermined quantities, Change Order will be

executed on an estimated quantity basis; payment will be based on actual quantities measured as specified.

1.9 COST OF THE WORK CHANGE ORDER

- A. CONTRACTOR shall submit documentation required in Paragraph 1.4 of this Section on a daily basis for certification by AUTHORITY. AUTHORITY will indicate by signature that the submitted documentation is acceptable. If it is not acceptable, CONTRACTOR and AUTHORITY shall immediately meet to discuss resolution.
- B. After completion of the change and within 14 calendar days, unless extended by AUTHORITY, the CONTRACTOR shall submit in final form an itemized account with support data of all costs. Support data shall have been certified by AUTHORITY, as required above in paragraph A.
- C. AUTHORITY will determine the change allowable in Contract Price and Contract Time as provided in provisions of the Contract Documents.

1.10 EXECUTION OF CHANGE ORDERS

- A. AUTHORITY will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

1.11 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price as shown on Change Order.
- B. Promptly revise progress schedules to reflect any change in Contract Time, revise subs-schedules to adjust times for other items of Work affected by the change, and resubmit.
 - 1. Progress Schedule shall be updated to reflect the changed condition. It shall be identified as a unique single or multiple task activity and shall be linked to its predecessor and successor activities from the base schedule set of activities. An update to the cash flow schedule shall be made as well and to the extent possible, operational tasks shall be cross referenced to schedule of values categories
- C. Promptly enter changes in Project Record Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for preparation and submittal of Schedule of Values.

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 General Conditions
- B. Section 01 20 13 Applications for Payment
- C. Section 01 33 00 Submittals

1.3 FORMAT

- A. Form and content must be acceptable to AUTHORITY.
- B. CONTRACTOR's standard form or media-driven printout will be considered on request.
- C. Follow the table of contents of Project Manual and the Bid Schedule for listing component parts. Identify each line item by number and title of listed Specification sections.

1.4 CONTENT

- A. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for progress payments. Round off values to nearest dollar.
- B. For each major subcontract, list products and operations of that subcontract as separate line items.
- C. Coordinate listings with progress schedule.
- D. Component listings shall each include a directly proportional amount of CONTRACTOR's overhead and profit.
- E. For items on which payments will be requested for stored products, list sub-values for cost of stored products with taxes paid.
- F. Specific line item Values as indicated below shall be minimum acceptable amounts and must be included on all approved Schedules of Values and Applications for Payment:

1. Bid Items in Section 01 11 13 – Work Covered by Contract.
 - 2 Section 01 77 19 – Closeout Requirements. Value of all required Substantial Completion Submittals and Closeout Submittals shall be \$25,000.
 - 3 No progress payments will be made for Substantial Completion Submittals and Closeout Submittals until **all** submittal have been submitted to, and accepted by the AUTHORITY.
- G. The sum of values listed shall equal total Contract Price.

1.5 SUBMITTAL

- A. Submit a copy of Schedule in electronic format within 15 days after the Notice to Proceed. Subsequent updated Schedule of Values shall be presented for review ten days prior to each Application for Payment.
- B. Transmit on an AUTHORITY accepted form transmittal letter. Identify Project by AUTHORITY's title and Project number; identify Contract by AUTHORITY's Contract number.

1.6 SUBSTANTIATING DATA

- A. When AUTHORITY requires substantiating information, submit data justifying line item amounts in question.
- B. Provide an electronic copy of data with cover letter for each copy of the Application for Payment. Show application number and date, and line item by number and description.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED

- A. CONTRACTOR participation in preconstruction conferences.
- B. CONTRACTOR administration of progress meetings and pre-installation conferences.

1.2 RELATED REQUIREMENTS

- A. Section 01 11 13 – Work Covered By Contract Documents.
- B. Section 01 33 00 – Submittal Procedures.
- C. Section 01 45 00 - Quality Control.
- D. Section 01 77 19 – Closeout Requirements.
- E. Section 01 78 39 – Project Record Documents.

1.3 PRECONSTRUCTION CONFERENCES.

- A. AUTHORITY will administer a preconstruction conference (to be held at AUTHORITY's main office located in Anchorage) for execution of Contract and exchange of preliminary submittals.
- B. AUTHORITY will administer site mobilization conference at Project site for clarification of CONTRACTOR responsibilities in use of site and for review of administrative procedures.

1.4 PROGRESS MEETINGS

- A. CONTRACTOR shall schedule and administer weekly Project meetings throughout progress of the work (unless this requirement is waived by Authority).
- B.
- C. Attendance: Job superintendent, major Subcontractors and Suppliers; AUTHORITY and Engineers as appropriate to agenda topics for each meeting.
- D.
- E. Suggested Agenda: Review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of Work.
- F.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures.
- B. Construction Progress Schedules.
- C. Manufacturer's Instructions.
- D. Manufacturer's Certificates.

1.2 RELATED REQUIREMENTS

- A. Section 01 11 21 CONTRACTOR's Certification of Subcontractors
- B. Section 01 20 13 Applications for Payment
- C. Section 01 25 13 Product Options and Substitutions
- D. Section 01 26 57 Change Order Procedures
- E. Section 01 29 73 Schedule of Values
- F. Section 01 33 23 Shop Drawings, Product Data, and Samples
- G. Section 01 45 00 Quality Control
- H. Section 01 50 00 Construction Facilities and Temporary Controls
- I. Section 01 71 23 Construction Surveying
- J. Section 01 77 19 Closeout Requirements
- K. Section 01 78 39 Project Record Documents
- L. Division 02 Existing Conditions
- M. Division 03 Concrete
- N. Division 05 Metals
- O. Division 06 Wood, Plastics, and Composites
- P. Division 10 Specialties

- Q. Division 11 Spill Response Equipment
- R. Division 26 Electrical
- S. Division 31 Earthwork
- T. Division 32 Exterior Improvements
- U. Division 33 Utilities

1.3 PROCEDURES

- A. Delivery of Submittals:
 - 1. Within 10 days following Notice to Proceed, CONTRACTOR shall submit to Project Manager & Engineer in electronic format, a Submittal Register (Section 01 33 23 1.12A) as required by the Contract (by Section Number, Paragraph Number, Page Number, and time criteria if required). The schedule must be approved by the Project Manager or Engineer before any submittals required by the Contract will be accepted.
 - 2. A sample submittal register will be provided to the successful bidder upon request.
 - 3. Electronically transfer submittals directly to the Project Manager & Engineer.
 - 4. Minimize the number of submittals. Full divisions must be submitted together (no partial submittals will be accepted).
- B. Transmit each item on an AUTHORITY accepted form. Identify Project, CONTRACTOR, Subcontractor, and major Supplier. Identify pertinent Drawing sheet and detail number, and Specification section number, as appropriate. Identify deviations from Contract Documents by submitting a separate Substitution Request Form. Provide a minimum of 8 1/2" x 5 1/2" blank space on the front page for CONTRACTOR, and Engineer review stamps.
- C. Submit initial progress schedules and Schedule of Values in electronic format as directed by the Project Manager or Engineer, in accordance with Document 00 72 13 - General Conditions. Form and content shall be reviewed by Engineer, revise and resubmit as required. Submit subsequent updated schedules with each Application for Payment.
- D. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
- E. After Project Manager & Engineer Review of submittal, revise and resubmit as required, identifying changes made since previous submittal. The Project Manager will not return the first or revised copies of rejected submittals for re-use. DO NOT submit partial copies of submittals for incorporation into rejected submittal packages which have been kept by the Project Manager. Provide COMPLETE copies for each review.

- F. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

- G. If drawings, product submittals, samples, mock-ups, or other required submittals are incomplete or not properly submitted, Project Manager will not review the submittal and will immediately return submittal to CONTRACTOR. Project Manager will review a submittal no more than two times (incomplete or improper submittals count as one). CONTRACTOR shall pay all review costs associated with more than two reviews, unless a re-submittal is required due to new comments addressing previously submitted information.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit horizontal bar Gantt chart. Schedule shall show:
 - 1. Separate bar for each major trade or operation, identifying the duration of each activity and precedent activities.
 - 2. Complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Show each work plan and separate work area as a separate activity or group of activities.
 - 3. Submittal dates for Shop Drawings, product data, and samples, and product delivery dates, including any furnished by AUTHORITY and those under allowances.
 - 4. All required submittals and indicating the date for each required submittal.
 - 5. Show projected percentages of completion for each item of Work and submittal as of time of each Application for Progress Payment.
 - 6. Schedule shall be computer generated; (MS Projects, Sure-Trac, or Primavera); Gantt format with preceding and succeeding operational tasks indicated by relationship arrows. An accompanying cash flow chart shall reflect estimated monthly draw amounts. To the extent possible, operational tasks shall be cross referenced to schedule of values categories.

1.5 SCHEDULE OF VALUES

- A. Submit in accordance with Section 01 29 73 Schedule of Values.

1.6 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Submit in accordance with Section 01 33 23 Shop Drawings, Product Data and Samples.
- B. Submit signed and sealed engineering design calculations performed by a Professional Engineer licensed in the State of Alaska where the CONTRACTOR is responsible for design as required in the Contract Documents.

1.7 MANUFACTURER'S INSTRUCTIONS

- A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and

finishing, in quantities specified for product data.

1.8 QUALITY CONTROL DATA

- A. Submit in accordance with Section 01 45 00 Quality Control and individual specification sections.

1.9 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of construction throughout progress of Work.
- B. Submit photographs with daily work reports via email to the Engineer, Owner and Owner's representatives, not less than daily. Photographs may be sent as separate file from daily report.
- C. Photographs: Digital color photographs, minimum size 2 megapixels.
- D. Take site photographs from differing directions indicating relative progress of the Work on a daily basis.
- E. Take photographs as evidence of daily project conditions including but not limited to:
 - a. Demolition of structures & Utilities
 - b. Limits of excavation & placement of geotextile
 - c. Placement and compaction of classified fill
 - d. Culverts & Drainage Structures
 - e. Sump placement & connections
 - f. Pipe bedding
 - g. Containment liner
 - h. Finished grading & RipRap slope protection
 - i. Tank foundations
 - j. Tank placement
 - k. Mechanical & Electrical work
 - l. Fencing

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for submittals.

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 General Conditions
- B. Section 01 25 13 Product Options and Substitutions
- C. Section 01 33 00 Submittals
- D. Section 01 45 00 Quality Control
- E. Section 01 77 19 Closeout Requirements

1.3 SHOP DRAWINGS

- A. Present drawings in a clear and thorough manner. Label each Shop Drawing with AUTHORITY's Project name and Project number; identify each element of the Shop Drawings by reference to sheet number and detail, or schedule.
- B. Identify field dimensions; show relation to adjacent or critical features or Work or products.
- C. Minimum Sheet Size: 8-1/2"x11". Larger sheets may be submitted in multiples of 8-1/2"x11".

1.4 PRODUCT DATA

- A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification section and Article number. Show reference standards, performance characteristics, capacities, wiring and piping diagrams and controls, component parts, finishes, dimensions, and required clearances.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

1.5 SAMPLES

- A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for AUTHORITY selection.

- B. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- C. Approved samples which may be used in the Work are indicated in the Specification section .

1.6 MANUFACTURER'S INSTRUCTIONS

- A. Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing, and finishing under provisions of Section 01 45 00.

1.7 CONTRACTOR REVIEW

- A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
- B. Coordinate submittals with requirements of Work and of Contract Documents.
- C. Notify the Project Manager in writing at time of submittal, of any deviations from requirements of Contract Documents.
- D. Do not fabricate products or begin Work which requires submittals until return of submittal with Authority acceptance.

1.8 SUBMITTAL REQUIREMENTS

- A. Each submittal to be numbered by Specification Section and Paragraph. Revisions shall be identified by a hyphen after the paragraph, with a number designator. Example: 1st submittal "01 33 23.01" 2nd submittal "01 33 23.02".
- B. Transmit submittals in accordance with the required submittal schedule and in such sequence to avoid delay in the Work.
- C. Provide 8 1/2" x 5 1/2" blank space on each submittal for Contractor and Engineer stamps.
- D. Apply Contractor's stamp, signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of Work and Contract Documents.
- E. Coordinate submittals into logical groupings to facilitate interrelation of the items.
- F. Submit electronic copies of shop drawings required in the Contract. Contractor may be required to submit, to the Project Manager, four opaque reproductions of full-size

shop drawings at no additional cost to the Owner.

- G. Submit electronic copies of product data and manufacturer's instructions required by the contract.
- H. Submit number of samples specified in individual Specifications sections.
- I. Submit under AUTHORITY's accepted transmittal form letter. Identify Project by title and AUTHORITY's Project number; identify Contract by AUTHORITY's contract number. Identify Work and product by Specification section and Article number.
- J. Each submittal shall have as its face document a completed, AUTHORITY furnished, Submittal Summary form.

1.9 RESUBMITTALS

- A. After AUTHORITY review of submittal, revise and resubmit as required, identifying changes made since previous submittal. Provide total number of submittals as required for the first submission; if 6 are required and 4 were returned for revisions, submit 6 again. The AUTHORITY and Engineers will not return the first or revised copies of rejected submittals for re-use. DO NOT submit partial copies of submittals for incorporation into rejected submittal packages which have been kept by the AUTHORITY and/or Engineers. Provide COMPLETE copies for each review.

1.10 REVIEW

- A. AUTHORITY or authorized agent will review Shop Drawings, product data, and samples and return submittals within (14) working days.
- B. AUTHORITY or authorized agent will examine shop drawings for general arrangement, overall dimensions and suitability, and will return to the Contractor marked as follows:

"Submit Specified Item" - denotes that the item specified in the contract documents is required and substitutions are not acceptable.

"Approved" - denotes acceptance of the submittal.

"Approved With Corrections Noted" - denotes review is conditional on compliance with notes made on the submittal.

"Revise and Resubmit" - denotes that revisions are required in the submittal in order for the submittal to be generally consistent with the requirements of the Contract Documents. Required revisions will be identified to the Contractor. Resubmittal is required.

"Rejected" - denotes that the submittal does not meet the requirements of the Contract Documents and shall not be used in the Work. Reasons for rejection will be identified to the Contractor. Resubmittal is required.

- C. Review by AUTHORITY or authorized agent of shop drawings shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is consistent with the requirements of the Contract Documents. Review

of such drawings shall not relieve the Contractor of the responsibility for errors, dimensions, and detail design.

- D. AUTHORITY or authorized agent review will not extend to means, methods, techniques, sequences or procedures of construction (except in the case of construction specific submittals, such as erection plans) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in with the item functions.

1.11 DISTRIBUTION

- A. Duplicate and distribute reproductions of Shop Drawings, copies of product data, and samples, which bear Engineer's stamp, to job site file, record documents file, Subcontractors, Suppliers, and other entities requiring information.

1.12 SCHEDULE OF SUBMITTALS

- A. Submittal Register Form to be completed by Contractor and approved by AUTHORITY prior to submittal of any items.
- B. Submit shop drawings, product data and samples as required for each specification section.
- C. Format.
 - 1. Submittal schedule form as provided by AUTHORITY as outlined in Section 01 45 00 1.7.

Part 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not used

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Quality assurance.

1.2 RELATED REQUIREMENTS

- A. Section 00 72 13 General Conditions: Paragraph 3.4.2.

1.3 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date for receiving bids, unless otherwise stated in the Contract Documents.
- C. Obtain copies of standards when required by the Contract Documents.
- D. Maintain copy at Project Site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Project Manager before proceeding. Local code requirements, where more stringent than referenced standards, shall govern.
- F. Neither the contractual relationship, duties, nor responsibilities of the parties in Contract nor those of the Project Manager shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Quality Control Program Requirements
- B. Workmanship.
- C. Manufacturer's Instructions.
- D. Manufacturer's Certificates.
- E. Manufacturers' Field Services

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 General Conditions: Article 12, inspection and testing required by governing authorities.
- B. Section 01 33 00 Submittals: Submittal of Manufacturer's Instructions.
- C. Section 01 78 39 Project Record Documents: Shop Drawings, Product Data, and Samples: Submittal of Manufacturer's Instructions.
- D. Individual Specification Sections: Quality Control Requirements.

1.3 QUALITY CONTROL, GENERAL

- A. The CONTRACTOR shall assure that all materials and completed construction conform to contract Plans, technical specifications and other requirements, whether manufactured by the CONTRACTOR, or procured from subcontractors or vendors. When required, the CONTRACTOR shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be used. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the CONTRACTOR shall assume full responsibility for accomplishing the stated purpose.

1.4 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform Work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking

1.5 MANUFACTURER'S INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from AUTHORITY before proceeding.

1.6 MANUFACTURER'S CERTIFICATES

- A. When required by individual Specifications section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.7 MOCKUPS

- A. When required by individual Specifications section, erect complete, full-scale mockup of assembly at site, perform required tests, and remove mockup at completion, when approved by AUTHORITY.

1.8 MANUFACTURER'S FIELD SERVICES

- A. When required by manufacturer or when specified in respective Specification sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.
- B. Require manufacturer's representative to submit written report to AUTHORITY listing observations and recommendations.

1.9 TESTING REPORTS

- A. When required by individual Specification sections, provide a qualified third-party testing agency to test the work. Test reports shall be submitted to Authority upon receipt.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Temporary Utilities: water, sanitation, electrical, heating and communication systems.
- B. Temporary Construction Facilities: Field office for the use of CONTRACTOR personnel, storage yards and buildings, worker shelters and access roads.
- C. Temporary Controls: air/water pollution controls, erosion control and traffic control.
- D. Temporary Fuel Storage and Dispensing: fuel storage, secondary containment and dispensing facilities.

1.2 RELATED REQUIREMENTS

- A. Section 01 11 13 Work Covered by Contract Documents
- B. Section 01 33 00 Submittals
- C. Section 01 57 13 Temporary Erosion & Sediment Control

1.3 DELIVERY, STORAGE AND HANDLING OF TEMPORARY FACILITIES

- A. Protect temporary facilities during delivery and storage operations.
- B. Maintain temporary facilities in proper and safe condition throughout progress of the work.

1.4 SUBMITTALS

- A. Submit an electronic copy of written Plan for providing temporary facilities. Submit plan a minimum of 60 days from receipt of the "Intent to Award letter".
 - 1. Plan shall include written description of CONTRACTOR's proposed methods and means of providing temporary utilities during construction activities, as described in the Specifications.
 - 2. Contractor shall receive written approval of the plan by the Engineer prior to beginning any work that could interfere with existing fuel handling and sales operations

PART 2 - PRODUCTS

2.1 TEMPORARY UTILITIES - CONTRACTOR FURNISHED ITEMS

A. Temporary Sanitation Systems

1. CONTRACTOR shall furnish and install all necessary components and systems to provide sewer and solid waste collection services at the field office. Temporary outhouses shall be self-contained units, pit privies are not acceptable.
2. CONTRACTOR furnished items include, but are not limited to, all piping, valves, fittings, structures, insulation, pumps, tanks, fixtures, tie-ins, trash receptacles, hauling operations and service agreements.
3. CONTRACTOR to provide and pay for all temporary sanitation system related components and fees.

B. Temporary Electrical Systems

1. CONTRACTOR shall coordinate with local utility to provide all electrical service necessary for completion of the work. Complete necessary utility paperwork and provide minimum 60 days' notice to local utility for hookup.
2. CONTRACTOR furnished items include, but are not limited to, all conductor, transformers, service meters and masts, distribution panels, controls, electrical and lighting fixtures, tie-ins, and service agreements.
3. CONTRACTOR shall be responsible for providing temporary power to all electrical control panels to ensure that they remain heated from the time of installation to substantial completion.
4. CONTRACTOR to provide and pay for all temporary electrical system related components and fees including hookup.

C. Temporary Heating Systems

1. CONTRACTOR shall furnish and install all necessary components and systems to provide heat at the field office and worker shelters as required.
2. CONTRACTOR furnished items include, but are not limited to, all heaters, fuel tanks, piping, valves, fittings, meters, insulation, pumps, fixtures, tie-ins, and fuel hauling.
3. CONTRACTOR to provide and pay for all temporary heating system related components and fees.

D. Temporary Communication Systems (Telephone, Fax, and Internet)

1. CONTRACTOR shall furnish and install all necessary components and systems to provide telephone, fax and internet service to the field office.
2. CONTRACTOR furnished items include, but are not limited to, all phone lines, phones, fax machines, tie-ins, and service agreements.

3. CONTRACTOR to provide and pay for all temporary communication system related components and fees.

2.2 TEMPORARY CONSTRUCTION FACILITIES CONTRACTOR FURNISHED ITEMS

A. Temporary Construction Facilities (Field Office, Storage Facilities, Worker Shelters)

1. Temporary field office: Furnish field office building for use of CONTRACTOR personnel. Field office structure shall meet all requirements of the most current version of the IBC. Provide temporary electrical, heating, telephone, fax and internet services at the field office.
2. Temporary storage facilities: CONTRACTOR shall furnish temporary storage facilities as required to protect materials and equipment during the course of the work. Facilities shall be structurally sound and sufficiently weather tight to protect stored items in accordance with the manufacturer's recommendations.
3. Worker shelters: Worker shelters shall be provided in accordance with applicable laws and regulations.
4. CONTRACTOR to provide and pay for all temporary construction facility related components and fees.

2.3 TEMPORARY CONTROLS CONTRACTOR FURNISHED ITEMS

A. Temporary Controls

1. Furnish all gates, barricades, fences, handrails, guardrails, and security systems required for safe execution and protection of the work.
2. Furnish all Guards, markers, shields, protective clothing, hard hats, hearing protection and other equipment required by health and safety regulations for workers.
3. Furnish erosion controls in accordance with industry accepted Best Management Practices and in accordance with Section 01 57 13.
4. Furnish all required first aid and fire suppression equipment required by laws and regulations.
5. CONTRACTOR to provide and pay for all temporary controls related components and fees.

PART 3 – EXECUTION

3.1 TEMPORARY UTILITIES

- A. All work relating to temporary utilities shall be arranged and implemented by the CONTRACTOR.

- B. All costs associated with providing temporary utilities shall be borne solely by the CONTRACTOR including hookup.
- C. CONTRACTOR shall not connect to any existing utility system unless specific written authorization from the applicable utility company is given.
 - 1. CONTRACTOR shall provide individuals who are qualified to connect to the existing utility system and provide all necessary equipment and materials required for the connection.
 - 2. CONTRACTOR shall at no time exceed the usage allowed by AUTHORITY or other entity governing the utility.
 - 3. CONTRACTOR shall remove all temporary materials and equipment upon completion of construction and repair any damage caused by installation, and restore to like new condition.
- D. Water: Provide temporary water for all construction requirements and CONTRACTOR's crews. CONTRACTOR shall maintain sanitary conditions at all times and shall not violate requirements of applicable codes.
- E. Sanitation Facilities: Provide and maintain facilities for CONTRACTOR's employees, SubCONTRACTORS and all other onsite employer's employees. Service, clean, and maintain facilities and enclosures.
- F. Electricity and Lighting: Provide temporary power for all construction requirements including CONTRACTOR's field office and to ensure safe work conditions and security of site. Provide temporary lighting as required to meet all applicable safety requirements to allow erection, application or installation of materials and equipment, and observation or inspection of the work.
- G. Heating: Provide temporary heating systems at the field office and other temporary construction facilities as required by laws and regulations.
- H. Communication Systems: Provide temporary communication systems at the field office including telephone, fax, and internet service.

3.2 TEMPORARY CONSTRUCTION FACILITIES

- A. Field Office: Contractor shall maintain an on-site field office
 - 1. Field office shall provide sufficient working space and sanitary facilities for Contractor personnel. Provide temporary electrical, heating, water, sewer, telephone, fax and internet services at the field office.
- B. Temporary Storage Yard:
 - 1. A temporary storage yard within the community shall be provided by the Contractor for storage of products, equipment, and materials used in the construction of the project.
- C. Temporary Storage Buildings:
 - 1. Environmental control systems shall be provided that meet recommendations of

manufacturers of equipment and materials stored.

2. Contractor shall arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Combustible materials (paints, solvents, fuels, etc.) shall be stored in a well-ventilated and remote building meeting applicable safety standards.

D. Access roads:

1. Access roads, if required, shall be constructed within easements, rights-of-way, or Project limits. Alignments for new routes shall be approved by Project Manager.
2. Ground surface disturbed by access road construction shall be restored to original grade upon completion of construction.

3.3 TEMPORARY CONTROLS

A. Air Pollution Controls:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to the site.

B. Water Pollution Controls:

1. CONTRACTOR shall not cause or permit action to occur which would cause a discharge to an existing waterway. See Section 01 57 13.

C. Erosion Control:

1. As specified in Section 01 57 13.

D. Vehicular and Pedestrian Traffic Controls

1. Comply with Laws and Regulations regarding closing or restricting the use of public thoroughfares. No public or private road or boardwalk shall be closed or impacted, except by written permission of the proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.
2. Work shall be conducted to interfere as little as possible with public travel.
3. If for any reason it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
4. Closures: Contractor shall maintain satisfactory means of exit for persons residing or having occasion to transact business along the route of the Work. If it is necessary to close off a thoroughfare or other access providing sole vehicular access to property for periods greater than 2 hours, provide written

notice to each owner so affected 3 days prior to such closure.

5. Maintenance of traffic is not required if Contractor obtains written permission from owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.
6. Contractor shall not block more than one-half the thoroughfare at any time during crossings.
7. Flaggers and guards, when required by regulation or when deemed necessary for safety, shall be furnished with approved orange wearing apparel and other regulation traffic control devices.
8. Contractor shall not block off emergency vehicle access without written permission from the Owner. Operations shall be conducted with the least interference to fire equipment access, and at no time prevent such access. Contractor shall furnish night emergency contact numbers to Authority.

3.4 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain work areas free of waste materials, debris, and rubbish. Maintain work site in a clean, orderly and organized condition. Materials should be clearly identified, with products covered and labeled. Materials should be identified with generator (CONTRACTOR) name.
- B. Collect and remove waste materials, debris, and rubbish from site periodically and dispose of in accordance with all Federal, State and local regulations.
- C. CONTRACTOR shall not dispose of hazardous materials such as mineral spirits, oil, chemicals, or paint thinner at the local land fill. Provide acceptable containers for collection and disposal of waste materials, debris and rubbish.

3.5 REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection, with the exception of temporary bulk fuel storage.
- B. Clean and repair damage caused by installation or use of temporary facilities. Restore permanent facilities used during construction to pre-construction condition.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION & SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- A. General Conditions and Supplementary Conditions.
- B. Division 31 Specifications.
- C. Requirements of Federal, State, and local statutes and regulations dealing with stormwater, pollution and erosion shall be strictly adhered to by the CONTRACTOR.CONTRACTOR

1.2 GENERAL

- A. CONTRACTOR shall comply with the storm water construction general permit APDES. If required, the CONTRACTOR shall provide all labor, equipment, materials, and services to prepare, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the APDES.
- B. CONTRACTOR shall implement erosion control as soon as practicable to limit the potential for sediment transport and rilling of disturbed slopes and/or embankment slopes.
- C. CONTRACTOR shall implement and comply with all conditions of the US Army Corps of Engineers Permit. (Available upon written request to the Owner).

1.3 ENVIRONMENTAL PROTECTION

The CONTRACTOR shall comply with the provisions of Federal, State and local statutes, ordinances and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources that may affect or may be affected by the Project. The CONTRACTOR shall familiarize himself with all such statutes, ordinances and regulations, whether listed or not.

1.4 DEFINITIONS

Repair. Mending or replacement of erosion and control measures to a degree as to meet the intended function as outlined in the ESCP, as determined by the Project Manager.

Repairs to erosion control measure can result from, but is not limited to, any degradation to the items from flooding, sediment deposition, wind, and construction activities.

1.5 SUBMITTALS

- A. Hazardous Material Control Plan.

Submit an electronic copy of the HMCP, to the Project Manager for approval. Submit these documents to the Project Manager at least 21 days before beginning

Construction Activity. After the HMCP is approved by the Owner, the CONTRACTOR must sign and certify the approved HMCP.

B. Inspection Reports

The CONTRACTOR shall submit an electronic copy of the routine inspection reports as defined in the Erosion and Sediment Control Plan. Reports shall be submitted to the Project Manager within 24 hours after the report is recorded.

C. Approved SWPPP, if required under section 1.2 above.

PART 2 - EROSION, SEDIMENT, AND POLLUTION CONTROL

2.1 TEMPORARY AND PERMINENT EROSION CONTROL

- A. Temporary erosion and pollution control measures that are required at CONTRACTOR-furnished sites are subsidiary.
- B. Perform temporary erosion and pollution control measures that are required due to your negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer, or for your convenience, at your own expense.
- C. Permanent erosion and pollution control measures will be measured and paid for under other contract items, when shown on the bid schedule.

PART 3 - EXECUTION

3.01 EROSION CONTROL

Best management practices for erosion control shall be observed to prevent construction related erosion impacts to receiving waters.

END OF SECTION

SECTION 01 60 13

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Products.
- B. Transportation and Handling.
- C. Storage and Protection.

1.2 RELATED REQUIREMENTS

- A. Section 01 45 00 Quality Control: Submittal of manufacturers' certificates.
- B. Section 01 42 19 Reference Standards.

1.3 PRODUCTS

- A. Products include material, equipment, and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.
- D. Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

1.4 TRANSPORTATION AND HANDLING

- A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Immediately on delivery, inspect shipment to assure:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.
 - 4. Containers and packages are intact and labels legible.
 - 5. Products are protected and undamaged.

1.5 STORAGE AND PROTECTION

- A. Handle and store materials for construction, products of demolition, and other items to avoid damage to adjacent facilities and equipment.
- B. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter. Cover such material to prevent material from being blown away.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.
- E. Provide Material Safety Data Sheets (MSDS) for all products which may produce unpleasant or noxious odors. CONTRACTOR shall provide for adequate venting if needed.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 64 00
RECEIPT OF OWNER FURNISHED MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes receipt, unloading, transportation, storage, and handling of materials furnished by the Owner for this project. This includes the following:

TABLE 1

ITEM NUMBER	MATERIAL DESCRIPTION	QTY	UNIT	APPROXIMATE VALUE (EA UNIT)	APPROXIMATE WEIGHT/ DIMENSIONS	FOB POINT & AVAILABILITY DATE
1	11,600-gal Tank, catwalk, & ladder	1	EA	\$75,000	10.5' Ø x 18' Weight - Unknown	Anchorage, Alaska March 15 th , 2020. See Note 1.

Table Notes:

1. Tank is located at:

Alaska Energy Authority (Shop)
2601 Commercial Drive
Anchorage, Alaska 99501

Contractor shall receive the tank & associated catwalk/ladder at the location noted above and provide all required loading and transportation to the final installed location.

2. All other material required for the proper execution and construction of the project shall be provided by the Contractor.

1.2 DELIVERY OF OWNER FURNISHED MATERIAL

- A. Material furnished by the Owner shall be delivered and transferred to the Contractor at FOB points specified in the Table above.
- B. Coordinate with tank manufacturer for storage and acceptance receipt.

1.3 ACCEPTANCE OF OWNER FURNISHED MATERIAL

- A. The Contractor shall (1) receive and accept the materials at the delivery point specified; (2) inspect all materials to confirm that the materials delivered are in good condition and the quantities are correct; and (3) execute a receipt for all materials accepted from the Owner. Delinquency in signing material receipts may result in delayed progress payments.
- B. All material furnished by the OWNER shall comply with the plans and specifications. All materials which do not meet specifications or are received broken or damaged shall be culled by the Contractor and a report made to the OWNER and Engineer within 5-days of receipt of material as to the number culled and reason for culling.

- C. If the OWNER fails to deliver the materials set forth in Table 1, the Contractor's sole remedy and compensation shall be an extension of time not greater than the delay. Any such time extension shall be requested in writing by the Contractor.

1.4 RECEIPT, TRANSPORTING AND STORING OWNER FURNISHED MATERIAL

- A. The Contractor shall receive, transport, and protect all material in accordance with the manufacturer's instructions. All material, which is not installed immediately upon receipt, shall be stored in accordance with the manufacturer's instructions in a temperature controlled environment (above freezing).
- B. All handling charges required for receiving, loading, unloading, hauling, transporting or storing the material shall be provided by the Contractor.
- C. Any demurrage charges of or other fees incurred as a result of the Contractor not receiving, moving and storing the material shall be paid by the Contractor. If the OWNER is required to pay these fees, the fees will be deducted from the first Contractor pay request.
- D. The Contractor shall provide proper equipment as necessary to load, unload, and transport OWNER furnished material. The equipment shall be rated as required to properly handle the material.

1.5 DAMAGE TO OWNER FURNISHED MATERIAL

- A. Upon receipt of the materials as specified above, the Contractor shall become solely responsible for their care, transportation, storage, and protection. In the event materials are damaged, lost, stolen, or destroyed by any cause whatsoever after the Contractor has received them, their repair or replacement shall be entirely at the Contractor's expense.
- B. All material replaced by the Contractor shall be equal to the material provided by the OWNER and shall meet the material purchase specifications.

1.6 STORAGE OF OWNER FURNISHED MATERIAL

The Contractor shall provide storage for all OWNER furnished material and shall be responsible for transporting the material to the jobsite as required to support the construction schedule.

1.7 EXCESS MATERIALS

All materials furnished by the OWNER in excess of those actually used in the construction of the project shall be stored in accordance with the manufacturer's instructions until the OWNER collects them. The Contractor shall provide a complete list of excess materials to the Owner and Engineer.

PART 2 - PRODUCT (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23 CONSTRUCTION SURVEYING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This section is intended to establish a standard minimum level of acceptable field survey specifications and procedures to properly control the construction project.
- B. The CONTRACTOR shall furnish all labor and materials necessary to perform all surveying and construction staking essential for the completion of construction in conformance with the drawings, specifications, and other Contract Documents. The CONTRACTOR shall perform all the necessary calculations required to accomplish the work.
- C. It is the CONTRACTOR's responsibility to ensure proper survey methods and procedures are followed. The CONTRACTOR, at no additional expense to the Owner, shall correct any errors resulting from the survey. Any method conflicting with these survey specifications shall be approved by the Project Manager prior to its use.
- D. All survey work performed shall be under the direct supervision of a Professional Land Surveyor registered in the State of Alaska.

1.2 RELATED SECTIONS

- A. Section 01 78 39 Project Record Documents

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROJECT CONTROL

- A. General: The Owner will provide reference horizontal and vertical control data to facilitate construction staking. It is the CONTRACTOR's responsibility to establish and check all survey control prior to any staking activity to ensure that the Project is properly located and constructed according to the Contract Documents. If discrepancies are found, Project Manager shall be notified separately and immediately. The CONTRACTOR is responsible for preserving and protecting all line stakes, grade stakes, reference points, and hubs. In the event of their loss or destruction the CONTRACTOR shall pay all costs for their replacement. The CONTRACTOR shall replace any monument that exists within the construction limits if it is disturbed or removed due to construction project activity. All monumentation disturbed or removed shall be replaced with the same type of monument or a monument approved by the Project Manager.
- B. Horizontal Control Accuracy: The maximum permissible linear error allowed in establishing horizontal control is 1:5000 feet. The maximum error allowed in unadjusted angular closure shall be calculated by the formula "30 multiplied by

the square root of N” where the term “N” signifies the number of transit setups in the traverse and “30” signifies 30 seconds.

C. Vertical Control

1. Elevations shall originate from the datum provided in the Contract Drawings. All level circuits run to establish temporary benchmarks (TBM) shall have an accuracy no less than the value computed by the equation “0.1 feet multiplied by the square root of the distance in miles.” Foresights and backsights shall be balanced. The maximum sighting distance shall not exceed 300 feet. All leveling circuits establishing TBMs shall be adjusted using recognized standard surveying adjustment methods. Side shots to establish elevations on TBMs shall not be allowed.
2. A minimum of two known benchmarks shall be used when establishing TBMs to verify correct elevation information. A sufficient number of TBMs shall be set to control the Project with a maximum spacing of 800 feet. A TBM shall not be located further than 200 feet outside the construction limits of the Project. All TBMs shall be located and be comprised of sufficient material such that their integrity will not be compromised throughout the life of the Project.

3.2 FIELD NOTES

- A. The CONTRACTOR shall supply uniform, hard backed, write in rain survey field books. The OWNER has the right to inspect the field books at any time during the Project. All field books shall be identified on the outside spine. Each book shall be indexed and its contents referred to by page number. The date, weather condition, survey crew personnel, and instruments used shall be shown at the beginning of each day’s notes. All field books containing field notes shall be sealed and signed by a Registered Professional Land Surveyor on the title page of each field book. Copies of all field books used in the process of work shall be submitted to the Project Manager upon completion of the work.
- B. All observations shall be recorded directly into project field books. All field books shall be in pencil. All field notes and drawings shall be completed and reduced before acceptance by the Project Manager. Control sketches and traverse data shall be graphic and show measured and recorded distances. The source of record shall be stated. Stationing shall increase from the bottom of the page to the top. Notes shall be neat, legible, precise and sufficiently detailed. The Project Manager may stop all survey work until the notes are brought into conformance with this specification. A copy of each day’s field notes shall be reduced and available to the Project Manager by 12:00 PM the following workday. The Project Manager may issue a stop work order at the CONTRACTOR’s expense if the field notes are not delivered, when requested, within this time frame.
- C. Erasures of errors in field books will not be accepted. A line shall be drawn through those portions of notes in error, leaving the original note legible, and the correction shall be noted above the original entry. Corrections shall be initialed by the party chief and dated. Where appropriate, a note explaining the error shall be included.
- D. Failure on the part of the CONTRACTOR to keep and maintain complete and accurate field notes as required herein shall be sufficient reason to withhold payment for those items of work where survey is required. No final Project

payment will be made to the CONTRACTOR until copies of the field books have been submitted to and approved by the Project Manager.

3.3 PARTY CHIEF'S DAILY DIARY

- A. The survey party chief shall keep a factual daily diary of all work performed by the survey crew on this Project. The diary shall contain the following information: date, crew, type and location of work performed, work accomplished, orders from the Project Manager and signature.
- B. This record shall be kept on the Project Site and submitted to the Project Manager upon request. A copy of the diary shall be submitted to AUTHORITY upon completion of the Project.

3.4 MISCELLANEOUS CONSTRUCTION STAKING

- A. The CONTRACTOR shall provide sufficient stakes for the adequate control of all structures and incidental construction not specifically covered above. A staking diagram with respect to fuel line stations and measurements for pay quantities shall be maintained in the field notes. Other items such as horizontal and vertical control shall be shown in the field book and shall be governed by procedures established in previous articles of this specification.

3.5 ELECTRONIC DATA COLLECTION AND RADIAL SURVEYS

- B. When electronic data collection is used for radial stakeout, the following criteria shall be maintained and submitted:
 - 1. A standard field book containing: date, weather conditions, instrumentation used, crew, project description and sketch, listing of turning points and control points used, and other information needed to reconstruct the survey activity.
 - 2. A printout of the unedited output from the data collector or a copy of the field book entries to include: code descriptors, horizontal circle information, vertical circle information based on zenith angle and slope distance expressed in feet. Also, a sheet containing the explanation of the codes used to identify the various shots.
 - 3. A printout of the reduced and adjusted (ratios of error and magnitude of misclosure shown) data represented by x, y, and z coordinates, plus necessary descriptive information.
 - 4. A plot and or line drawing showing the control points, point occupied, and the radial observations at a scale large enough to read the point number, elevation, point descriptions, and coordinates.
 - 5. If cross sectional data is collected by radial methods a printout/plot of the following data is required:
 - a. Each point identified as it relates to the fuel line centerline station.
 - b. The distance offset from centerline of the fuel line.
 - c. The elevation and description of the shot.
 - d. A cross section line plot of each station with the individual shots averaged out to produce the final interpolated cross section.
 - e. The vertical angle and distance to the TBM's used for control and the

instrument height, and the height of the prisms.

3.6 AS-BUILT SURVEYS, FIELD NOTES AND PROJECT RECORD DOCUMENTS

- A. As-built survey measurements shall be recorded on a clean set of design drawings deemed the Project Record Documents and shall show changes and improvements which vary from the dimensions, lines, grades, locations and materials as shown on the Contract Drawings. The as-builts shall also include swing ties to all pertinent existing structures, in accordance with Section 01 78 39.
- B. Survey measurements shall be taken, field notes shall be kept, and accuracies shall be attained in accordance with the specifications of this section.
- C. Provide an electronic file, suitable for insertion into AutoCAD, with as-built features indicated by horizontal position, description, and elevation, based on Project coordinates. Electronic data collection used to obtain as-built information does not relieve the CONTRACTOR's obligation to maintain Project Record Documents or the obligation to obtain swing ties.
- D. A copy of all survey field notes shall be submitted with each pay request. Pay requests shall not be processed until the survey notes are received by the Project Manager and the Project Manager is provided evidence that the Project Record Documents are current and in the required condition.
- E. Project Record Documents shall be redlined and kept current. They shall be kept ready for review for when the Project Manager, at his/her option, requests that the Project Record Documents be submitted with the survey field notes for the pay request.
- F. Project Record Documents shall be submitted along with a copy of the field notes to the Project Manager at the completion of construction activity, in accordance with Section 01720 Project Record Documents, of these Specifications.
- G. A completed FEMA Elevation Certificate (EC) FEMA form 086-0-33 shall be submitted prior to the substantial completion inspection.

PART 4 - BASIS OF MEASUREMENT AND PAYMENT

4.1 BASIS OF MEASUREMENT

- A. There is no measurement for this item.

4.2 BASIS OF PAYMENT

- A. All costs associated with these items shall be subsidiary to Civil Site Work bid items.

END OF SECTION

SECTION 01 77 19

CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Administrative provisions for Substantial Completion and for Final Acceptance.
- B. Closeout Procedures.
- C. Final Cleaning.
- D. Project Record Documents.
- E. Warranties and Bonds.
- F. Spare Parts and Maintenance Materials.

1.2 RELATED REQUIREMENTS

- A. Division 00 Bidding and Contract Requirements
- B. Document 00 70 00 General Conditions: Fiscal provisions, and additional administrative requirements.
- C. Section 01 78 39 Project Record Documents

1.3 SUBSTANTIAL COMPLETION SUBMITTALS

- A. Submit the following prior to requesting a Substantial Completion Inspection:
 - 1. Project Record Documents:
 - 2. Operation and Maintenance Data (O&M Manual).
 - 3. Spare Parts and Maintenance Materials

1.4 SUBSTANTIAL COMPLETION

- A. Substantial Completion shall be considered by AUTHORITY when:
 - 1. Written notice is provided 7 days in advance of inspection date.
 - 2. List of items to be completed or corrected is submitted.
 - 3. Equipment and systems have been tested, adjusted, balanced and are fully operational.
 - 4. Operation of system has been demonstrated to AUTHORITY Personnel.
 - 5. Certificates of Inspection for required inspections have been submitted.

6. Project Record Documents for the Work or the portion of the Work being accepted are submitted and approved.
 7. Spare parts and maintenance materials are turned over to AUTHORITY.
- B. Should AUTHORITY inspection find Work is not substantially complete, Agency will notify CONTRACTOR in writing, listing observed deficiencies.
 - C. CONTRACTOR shall remedy deficiencies and send a second written notice of Substantial Completion.
 - D. When AUTHORITY finds Work is substantially complete AUTHORITY will prepare a certificate of Substantial Completion in accordance with provisions of General Conditions.

1.5 FINAL COMPLETION

- A. When CONTRACTOR considers Work is complete, submit written certification:
 1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents, and deficiencies listed with certificate of Substantial Completion have been corrected.
 4. Work is complete and ready for final inspection.
- B. Should AUTHORITY inspection find Work incomplete, AUTHORITY will promptly notify CONTRACTOR in writing listing observed deficiencies
- C. CONTRACTOR shall remedy deficiencies and send a second certification of Final Completion.
- D. When AUTHORITY finds Work is complete, AUTHORITY will consider closeout submittals.

1.6 REINSPECTION FEES

- A. Should status of completion of Work require more than two reinspections by AUTHORITY due to failure of Work to comply with CONTRACTOR's responsibility, AUTHORITY will deduct the cost of reinspection from final payment to CONTRACTOR as provided in the Contract Documents.
- B. Reinspection fees shall not exceed \$5,000 for any one reinspection.

1.7 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
- B. Warranties and Bonds:
- C. Operations and Maintenance Manuals:
- D. Evidence of Payment: In accordance with Conditions of the Contract.
- E. Consent of Surety to Final Payment.

- F. Certificate of Release.

1.8 STATEMENT OF ADJUSTMENT OF ACCOUNTS

- A. Submit final statement reflecting adjustments to Contract Price indicating:
 - 1. Original Contract Price.
 - 2. Previous Change Orders.
 - 3. Changes under allowances.
 - 4. Changes under Unit Prices.
 - 5. Deductions for uncorrected Work.
 - 6. Penalties and bonuses.
 - 7. Deductions for liquidated damages.
 - 8. Deductions for reinspection fees.
 - 9. Other adjustments to Contract Price.
 - 10. Total Contract Price as adjusted.

 - 11. Previous payments.
 - 12. Sum remaining due.
- B. AUTHORITY will issue a final Change Order reflecting all remaining adjustments to Contract Price not previously made by Change Orders.

1.9 APPLICATION FOR FINAL PAYMENT

- A. Submit application for final payment in accordance with provisions of the General Conditions of the Contract.

1.10 FINAL CLEANING

- A. Execute final cleaning prior to Substantial Completion inspection.
- B. Use materials which will not create hazards to health or property, and which will not damage surfaces. Follow manufacturer's recommendations.
- C. Remove waste, debris and surplus materials from the site.

1.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.12 PROJECT RECORD DOCUMENTS

- A. Comply fully with the requirements of Section 01 78 39 Project Record Documents.

1.13 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities

specified in individual Specification Sections & Design Drawings.

- B. Deliver to Project site and place in location as directed, obtain receipt prior to final payment.

1.14 WARRANTIES

- A. As a condition precedent to Final Payment, all guaranties and warranties as specified under various sections of the Contract Documents shall be obtained by the CONTRACTOR and delivered to the AUTHORITY, in duplicate giving a summary of guarantees attached and stating the following in respect to each:
 - 1. Character of Work affected.
 - 2. Name of Subcontractors.
 - 3. Period of Guarantee.
 - 4. Conditions of Guarantee.
- B. Delivery of said guarantees and/or warranties shall not relieve the CONTRACTOR from any obligations assumed under any other provision of the Contract.
- C. If, within any guarantee period, repairs or changes are required in connection with the guaranteed Work, which in the opinion of the AUTHORITY is rendered necessary as the result of the use of materials, equipment or workmanship, which are defective, or inferior, or not in accordance with the terms of the Contract, the CONTRACTOR shall, upon receipt of notice from the AUTHORITY, and without expense to the AUTHORITY, proceed within seven (7) calendar days to:
 - 1. Place in satisfactory conditions in every particular all of such guaranteed Work, correct all defects therein, and make good all damages to the structure or site.
 - 2. Make good all Work or materials, or the equipment and contents of structures or site disturbed in fulfilling any such guarantee.
 - 3. If the CONTRACTOR, after notice, fails to comply without the terms of the guarantee, the AUTHORITY may have the defects corrected and the CONTRACTOR and CONTRACTOR's Surety shall be liable for all expenses incurred in connection therewith, including Engineer's fees.

1.15 OPERATIONS AND MAINTENANCE DATA (O&M MANUALS)

- A. Provide four O&M manual specific to each facility.
- B. Submit data in bound 8-1/2 x 11 inch text pages, ring binders with durable plastic covers. Include an electronic copy with all submittals.
- C. Prepare binder cover with printed title "OPERATIONS AND MAINTENANCE DATA", title of project, and subject matter of binder.

- D. Binder contents shall be divided with plastic page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

- E. Contents: Prepare a table of contents for each volume, with each Product or system description identified, enclosed in a plastic text sheet sleeve, in three parts as follows:
 - 1. Part 1: Directory, listing names, addressees and telephone numbers of A/E, Contractor, subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and Product data.
 - b. Pressure test reports.
 - c. Certificates.
 - d. Copies of Warranties and Bonds.

- F. Submit one (1) draft copy of completed volumes five (5) working days prior to Substantial Completion inspection. Revise and resubmit as necessary.

- G. Submit four (4) sets of revised final approved manuals within 15 days of Substantial Completion inspection or date of approval of draft operations and maintenance manuals.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Maintenance of Record Documents and Samples.
- B. Submittal of Record Documents and Samples.

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 General Conditions: Record Documents.
- B. Section 01 33 00 Submittals
- C. Section 01 33 23 Shop Drawings, Product Data, and Samples
- D. Section 01 77 19 Contract Closeout Procedures

1.3 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. In addition to requirements in General Conditions, maintain at the site for the Owner one accurate record copy of:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and samples.
 - 6. Survey and field records.
 - 7. Field test records.
 - 8. Inspection certificates.
 - 9. Manufacturer's certificates.
- B. Prior to Substantial Completion, provide original or legible copies of each item maintained by CONTRACTOR as listed in 1.3 A above.
- C. Delegate responsibility for maintenance of Record Documents to one person on CONTRACTOR's staff.

- D. Promptly following award of Contract, secure from AUTHORITY, at no cost to the CONTRACTOR, one complete set of all Documents comprising the Contract.
- E. Immediately upon receipt of job set described above, identify each Document with title "RECORD DOCUMENTS - JOB SET".
- F. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.
- G. Label and file record documents and samples in accordance with section number listings in table of contents of this Project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- H. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.
- I. Use all means necessary to maintain job set of Record Documents completely protected from deterioration and from loss and damage until completion of Work and transfer of recorded data to AUTHORITY.
- J. Keep record documents and samples available for inspection by AUTHORITY.
- K. Upon request by AUTHORITY and at time of each Application for Payment submit complete collection of record documents to AUTHORITY for review and duplication as desired.
- L. AUTHORITY'S approval of current status of Record Documents will be prerequisite to AUTHORITY'S approval of requests for progress payments and request for final payment.
 - 1. Prior to submitting each request for progress payment, secure AUTHORITY'S approval of Record Documents as currently maintained.
 - 2. Prior to submitting request for Final Payment, obtain AUTHORITY'S approval of final Record Documents.
- M. Do not use job set for any purpose except entry of new data and for review and copying by AUTHORITY.

1.4 RECORDING

- A. Record information on a set of black line opaque Drawings, and in a copy of a Project manual.
- B. Using felt tip marking pens or colored pencil, maintaining separate colors for each major system, clearly describe changes by note and by graphic line, as required. Date all entries. Call attention to entry by a "cloud" around area or areas affected.
- C. Thoroughly coordinate all changes within Record Documents, making adequate and proper entries on each Specification Section and each sheet of Drawings and other Documents where such entry is required to properly show change or

selection.

- D. When a change within Record Documents is referenced to another document, such as a DC/VR, Shop Drawing or Change Order, attach a copy of the referenced document to the respective Record Drawing or Record Specification where the entry is made.
- E. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:
 - 1. Measured depths of elements of foundation in relation to finish first floor datum, accurate to the nearest inch.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements, accurate to the nearest inch.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by modifications.
 - 6. Details not on original Contract Drawings.
 - 7. References to related Shop Drawings and modifications.
 - 8. Clearly label all changes and show dimensions to establish size and location. All identifications shall be sufficiently descriptive to relate reliably to Specifications.
- F. Specifications: Legibly mark each item to record actual construction, including:
 - 1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
 - 2. Changes made by Addenda and modifications.
- G. Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records required by individual Specifications sections.

1.5 SUBMITTALS

- A. Upon submittal of the completed Record Documents, make changes in Record Documents as required by AUTHORITY.
- B. Transmit with cover letter in duplicate, listing:
 - 1. Date.
 - 2. Authority's Project title and number.

3. CONTRACTOR's name, address, and telephone number.
4. Number and title of each record document.
5. Signature of CONTRACTOR or authorized representative.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 02 32 00 GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- A. Section 00 80 00 Supplementary Conditions.
- B. Section 31 23 00 Excavation and Fill.

1.2 SOIL REPORTS

A. General:

1. Any data on soil and/or subsurface conditions shown in the Contract Drawings or Specifications is not to be taken as a representation, but is based on limited information and is at best only an opinion; consequently, such data cannot be considered precise or complete.
2. The information contained in the soils report and this section may not be representative of the actual soil conditions at the time or location of the Contractor's work, and the Contractor is solely responsible for costs associated with interpretations made from the information and there is no guarantee as to its completeness, accuracy, or precision.

B. Existing Conditions:

1. A formal geotechnical report is not available. Soil conditions observed during excavation at the site in October 2013 were as follows: Two test holes were advanced by rubber tired backhoe to a depth of 6-feet. No ice lenses or frozen ground was observed. Material consisted of dark brown saturated organic peat to a depth of 4.5–5' underlain with gravely silt to the depth of excavation. Water was present at the peat/silt interface with seepage occurring throughout the peat layer. **Dewatering during excavation is to be expected. Rig mats or other load distribution methods may be required to support equipment during excavation & removal of the peat.** Photos of the test holes are available upon request.

C. Additional Investigation:

1. Contractor is encouraged to visit the site and acquaint himself with site conditions before submitting a Bid, and the submission of a Bid shall be prima facie evidence that he has done so.
2. Prior to bidding, Contractor may make his own sub-surface investigations, as approved by the Engineer and Authority, to satisfy himself with site and subsurface conditions.

1.03 QUALITY ASSURANCE

- A. The Contractor shall make no deviations from the Contract Documents without specific written approval from the Authority.
- B. The Contractor shall be responsible for obtaining approval from responsible agency or property owner before performing any exploratory excavations.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Air-entraining admixture
 - 2. Water reducing admixture
 - 3. Concrete joint sealer
- B. Design Mixtures: Submit proposed concrete mix design. Indicate proposed mix design complies with requirements of ACI 301, Section 4 – Concrete Mixtures and ACI 318, Chapter 5 – Concrete Quality, Mixing and Placing. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, bent bar diagrams, bar arrangement, splices and laps, and supports for concrete reinforcement.
- D. Submit inspection and testing agency for approval.
- E. Submit results of field quality-control (Section 3.07) test and inspection reports.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- B. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Perform work of this section in accordance with ACI 318 and ACI 301. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces.
 - 1. Plywood, metal, or other approved panel materials.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, II, III.
- B. Aggregates: All aggregates shall be provided from an approved source.
 - 1. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch nominal maximum coarse-aggregate size.
 - 2. Fine Aggregate: ASTM C 33, Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Master Builders Rheocrete222, or approved equal.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable

2.5 CONCRETE MIXTURES

- A. Concrete mix design shall conform to ACI 318 for durability and quality.
- B. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 3000psi at 28 days, for Type I cement.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Minimum Cement Content: 6 sacks per cubic yard.
 - 4. Slump Limit: 4 inches, plus or minus 1 inch.
 - 5. Air Content: 6 percent, plus or minus 1 percent at point of delivery.
- C. Use accelerating admixtures in cold weather only when approved by the Project Manager. If approved, use of admixtures will not relax cold weather placement requirements.

2.6 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.7 CONCRETE MIXING

- A. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M.

2.8 CONCRETE ANCHOR ADHESIVE

- A. Concrete anchor adhesive shall be a two-component high-solids, epoxy-based system supplied in manufacturer's standard cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer. The adhesive anchor shall

have been tested and qualified for performance in cracked and uncracked concrete per ICC-ES AC308. Adhesive shall be set-xp, epoxy-tie, adhesive from Simpson strong-tie, or approved equal. Anchors shall be installed per manufacturer's instructions.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- D. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- E. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Project Manager.
- D. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete
- E. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Deposit concrete continuously in one layer so that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
- D. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- E. Hot-Weather Placement: Comply with ACI 301.

3.5 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- Apply to concrete surfaces not exposed to public view.

3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

3.8 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Project Manager. Remove and replace concrete that cannot be repaired and patched to Project Manager's approval.
- B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Project Manager.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

- B. Inspections:
1. Steel reinforcement placement.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 8. Test results shall be reported in writing to Project Manager, concrete manufacturer, and CONTRACTOR within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials,

compressive breaking strength, and type of break for both 7- and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Project Manager but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Project Manager. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Project Manager.
11. Additional testing and inspecting, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

SECTION 05 50 00

STRUCTURAL STEEL & METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes fabrication and erection of structural steel work, as shown on Contract Drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
 - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on Contract Drawings.
 - 2. This section applies, but is not limited to, stairways, railings, hose reel & dispenser enclosures pump boxes, truck fill containment areas, and other miscellaneous steel fabrications.

1.3 SUBMITTALS

- A. Product data or manufacturer's specifications and installation instructions for all products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
- B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel, including certified copies of mill reports covering chemical and physical properties.
 - 2. Structural steel coating system.
- C. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Complete details, dimensions, and schedules of fabrication and assembly of steel components.

- D. Welder's certifications.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Design, fabrication and erection shall comply with the most current provisions of the following standards of practice, except as otherwise indicated:
 - 1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
 - 3. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 - 2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PRODUCTS

- C. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- D. Structural Steel Shapes, Plates, and Bars: ASTM A36
- E. Structural Tubing: A500
- F. Threaded Fasteners: ASTM A325, Grade A, regular low-carbon steel bolts and nuts.

1. Provide hot dip galvanized hexagonal heads and nuts for all connections.

Electrodes for Welding: Use AWS 5.1 E70XX electrodes. Comply with AWS Code.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
- C. Bolt field connections, except where welded connections or other connections are indicated. Use ASTM A 307 hot dip galvanized bolts.
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Minimum weld shall be 3/16".
- E. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.
- G. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
- H. Tolerances: Structural component tolerances shall be +/- 1/8 inch and as required to adequately support loads.

2.3 STEEL COATING

- A. All structural steel components are to be hot-dip galvanized unless otherwise noted on the Contract Drawings.
- B. **Hot-dip Galvanizing:** Galvanize stairs, platforms, grating, panel supports, dispenser and hose reel enclosures, barge header support and all other structural steel shapes, plates, bolts and hardware in accordance with ASTM A123, G90 and ASTM A153. Finish all cut ends, field welds and damaged surfaces of galvanized and zinc plated supports and fasteners with spray on cold galvanizing compound, ZRC, or approved equal.
- C. Other Steel Coating:
 1. Prime prior to shipping from factory. After fabrication, sandblast or wire brush all steel to clean bare metal. Prime with universal red oxide primer, Devoe Rustguard 4140, or approved equal, to 1.5 mils minimum dry film thickness. Color: Red.
 2. After field fabrication is complete, top coat primer with two coats of alkyd enamel, Devoe Speed Enamel 4318, or approved equal, to 4 mils dry film thickness. Color: Haze Gray except where noted.

3. Coat in accordance with Section 15175 Aboveground Fuel Storage Tanks, Part 2.04 – Coating Systems, unless otherwise noted on Contract Drawings or Specifications.

2.4 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 1. At Contractor's expense, promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 1. Promptly notify Project Manager whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 ERECTION

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- B. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- C. Level and plumb individual members of structure within specified AISC tolerances.
- D. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Project Manager. Finish gas-cut sections equal to a sheared appearance when permitted.
- E. Touch-Up Repairs: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint or galvanizing.
 1. Galvanizing Repair: Galvanized coating at damaged areas shall be repaired according to ASTM A 780 (Annex A1) using zinc-based alloy repair sticks commonly known as "hot sticks".

2. Coating Repair: If underlying metal surface is exposed, wheel abrade or sandblast to clean metal and re-coat same as tanks. If damage does not fully penetrate coating then reapply top coat only to minimum DFT.

3.2 QUALITY CONTROL

- A. Authority will engage an independent testing and inspection agency to inspect welded connections and to perform tests and prepare test reports.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspection and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.
 3. Perform tests of full penetration welds as follows.
 - a. Ultrasonic Inspection: ASTM E 164.
- G. Field Welding: Inspect and test during erection of structural steel as follows:
 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.
 3. Perform tests of full penetration welds as follows:
 - a. Ultrasonic Inspection: ASTM E 164.

END OF SECTION

SECTION 05 53 00

METAL GRATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Metal bar gratings.
 - 2. Formed-metal plank gratings.
 - 3. Metal frames and supports for gratings.
 - 4. Metal bar grating stair treads.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Gratings: Provide gratings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Floors: Uniform load of 100lbf/sq. ft. or concentrated load of 2000 lbf, whichever produces the greater stress.
 - 2. Walkways and Elevated Platforms: Uniform load of 100 lbf/sq. ft.
 - 3. Sidewalks and Vehicular Driveways: Uniform load of 250 lbf/sq. ft. or concentrated load of 8000 lbf, whichever produces the greater stress.
 - 4. Stair Treads: Uniform load of 100 lbf/sq. ft. or concentrated load of 300 lbf.
- B. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" and shown in structural construction documents.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Metal bar gratings.
 - 2. Formed-metal plank gratings.
 - 3. Clips and anchorage devices for gratings.
 - 4. Paint products.

- B. Shop Drawings: Detail fabrication and installation of gratings.

1.4 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Metal Bar Gratings:
 - a. Alabama Metal Industries Corporation.
 - b. All American Grating, Inc.
 - c. Barnett/Bates Corp.
 - d. Borden Metal Products (Canada) Limited.
 - e. Fisher & Ludlow.
 - f. Grupo Metelmex, S.A. de C.V.
 - g. IKG Industries; a Harsco Company.
 - h. Marwas Steel Co.; Laurel Steel Products Division.
 - i. Ohio Gratings, Inc.
 - j. Seidelhuber Metal Products, Inc.
 - k. Tru-Weld.
 - l. Or Approved Equivalent Product.

2.02 METALS

- A. Ferrous Metals:
 1. Steel Plates, Shapes, and Bars: ASTM A 36.
 2. Wire Rod for Grating Crossbars: ASTM A 510.
 3. Uncoated Steel Sheet: ASTM A 1011, structural steel, Grade 30.
 4. Galvanized Steel Sheet: ASTM A 653, structural quality, Grade 33, with G90 coating.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.5 FABRICATION

- A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- B. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- C. Fit exposed connections accurately together to form hairline joints.
- D. Fabricate toeplates for attaching in the field.

2.6 METAL BAR GRATINGS

- A. Welded Steel Grating:
 - 1. Bearing Bar Spacing: 2"inch max (1/2" clear, max) o.c.
 - 2. Bearing Bar Depth: 1-1/4 inches.
 - 3. Bearing Bar Thickness: 3/16 inch.
 - 4. Crossbar Spacing: 4 inches o.c.
 - 5. Traffic Surface: **Serrated.**
 - 6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.
- B. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
- C. Fabricate cutouts in grating sections for penetrations indicated. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- D. Do not notch bearing bars at supports to maintain elevation.

2.7 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Grating may be supported on treated timbers where indicated in the Design Drawings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar

items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.

B. Galvanize steel frames and supports at all locations.

2.8 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. **Galvanizing:** All gratings shall be HDG. Apply zinc coating by the hot-dip process complying with ASTM A 123.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

B. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade the surfaces of units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Attach toeplates to gratings by welding at locations indicated.

D. Metal Bar Gratings: Comply with recommendations of referenced metal bar grating standards, including installation clearances and standard anchoring details.

1. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

2. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Wood blocking and nailers.
 - 4. Wood furring.
 - 5. Wood sleepers.
 - 6. Plywood backing panels.
- B. Related Sections include the following:
 - 1. Division 06 Section "Sheathing."
 - 2. Division 06 Section "Timber Construction"

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. RIS: Redwood Inspection Service.
 - 3. SPIB: The Southern Pine Inspection Bureau.

4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 1. Wood-preservative-treated wood.
 2. Power-driven fasteners.
 3. Powder-actuated fasteners.
 4. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide

lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat lumber as indicated on Drawings and the following:
 1. All, exposed framing, pipe supports, wood cants, nailers, curbs, equipment support bases, blocking, pipe supports, stripping, wood sills, foundations, sleepers, blocking, furring, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Treat all dimensional lumber unless approved in writing by Owner.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 of any of the following species:
 1. Hem-fir.

- C. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade and any of the following species:
 - 1. Hem-fir.
- D. Joists, Rafters, and Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2400F-2.0E
- E. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least 850 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.4 TIMBER FRAMING

- A. See Section 06 13 00 Timber Construction.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
 - 7. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
 - 1. Hem-fir.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C- D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
 - 1. Simpson Strong-Tie Co., Inc.
 - 2. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.
 - 1. Use for interior locations where stainless steel is not indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 316.
 - 1. Use for exterior locations and where indicated.
- E. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.
 - 1. Thickness: 0.062 inch.

- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
 - 1. Strap Width: 2 inches.
 - 2. Thickness: 0.062 inch.
- G. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
- H. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- I. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Width: 1-1/4 inches.
 - 2. Thickness: 0.062 inch.
 - 3. Length: 24 inches minimum and as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- H. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
- J. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
- K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with indicated fastener patterns where applicable.
 - 2. Use finishing nails, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 TIMBER FRAMING INSTALLATION

- A. Install timber with crown edge up and provide not less than 4 inches of bearing

on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.

- B. Install wood posts using metal anchors indicated.
- C. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 13 00
TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section applies to construction using timbers including, but not limited to, above ground pipe supports, tank supports, and timber foundation systems where shown on the drawings.

Related Sections include the following:

- 1. Division 06 Section "Sheathing" & "Rough Carpentry"

1.3 DEFINITIONS

- A. Timbers: Lumber of 5 inches nominal or greater in least dimension.
- B. Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority.
 - 3. WCLIB - West Coast Lumber Inspection Bureau.
 - 4. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of heavy timber construction to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

2.1 TIMBER, GENERAL

- A. A. General: Comply with DOC PS 20 and grading rules of lumber grading agencies certified by American Lumber Standards Committee Board of Review, as applicable.
1. Factory mark each item of timber with grade stamp of grading agency.
 2. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Preservative Treatment:
1. **Application: Treat all timber construction, unless otherwise indicated.**
 2. Pressure treatment in accordance with AWWA standard C22, 0.60 minimum retention, rated for ground contact.
 3. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Copper Naphthenate
 - b. Chromated Copper Arsenate (CCA)
 - c. Ammoniacal copper zinc arsenate (ACZA).
 4. Use process that includes water-repellent treatment.
- C. Timber Species and Grade: Hem-fir or hem-fir (North); No. 2 or better, NLGA, WCLIB, or WWPA.

2.2 TIMBER CONNECTORS

- A. Fabricate tie rods from galvanized round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A 668/A 668M.
- B. Fasteners: Stainless steel fasteners shall be provided for connections in all pressure-treated wood, unless the following requirements are met:
 - 1. Approval letters are submitted from both the wood treatment manufacturer and the fastener manufacturer, stating the proposed fasteners are suitable for permanent installations in exterior, exposed, wet locations.
 - 2. Steel fasteners, if approved shall be as a minimum ASTM A307 lags or bolts with a triple plate galvanized finish of an equivalent thickness to G185.
- C. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit except for treated wood where the treatment included a water repellent. Galvanized fasteners and assemblies do NOT require seal coating.

2.3 WOOD PRESERVATIVE

- A. Chemical solution for the treatment of field cuts and bore holes in accordance with the requirements of AWWA standard M4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Erect heavy timber construction true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Fit members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and assembly of units.
- C. Install timber connectors as indicated.
 - 1. Unless otherwise indicated, install lag bolts with same orientation within each connection and in similar connections.
 - 2. Pre-drill lead holes for lag screws:
 - a. The clearance hole for the shank shall have the same diameter as the shank, and the same depth of penetration as the length of unthreaded shank. Shank clearance hole shall be increased as required for countersinking.

- b. The lead hole for the threaded portion shall have a diameter equal to 40% to 70% of the shank diameter and a length equal to at least the length of the threaded portion.
 - c. The threaded portion of the lag screw shall be inserted in its lead hole by turning with a wrench, not by driving with a hammer.
 - d. Soap or other lubricant shall be used on the lag screws or in the lead holes to facilitate insertion and prevent damage to the lag screw.
- D. Field treat all cuts and bore holes in accordance with AWPA standard M4.

3.2 ADJUSTING AND CLEANING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber construction if repairs are not approved by Project Manager.

END OF SECTION

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Subflooring.
 - 4. Underlayment.
 - 5. Building paper.
 - 6. Building wrap.
 - 7. Sheathing joint-and-penetration treatment.
 - 8. Flexible flashing at openings in sheathing.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 4. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated plywood.
 2. Building wrap.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA C9.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with the ground, roofing, flashing, vapor barriers, and waterproofing. Treat all exterior plywood unless an alternate coating system is indicated.

2.3 WALL SHEATHING

- A. Wall Sheathing: Grade CD interior-APA with exterior glue for the size and span rating shown on the drawings.

2.4 FLOOR SHEATHING

- A. Plywood Floor Sheathing: APA rated Sturd-I-Floor, meeting requirements of

Doc PS1 for the sizes and span rating shown on the drawings.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 2. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - 3. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 10 14 00

SIGNS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section covers the furnishing and installation of signs at the bulk tank farms, fenced area, bulk transfer area, dispenser, and marine header.
- B. The Contractor shall furnish all signs and fasteners.

1.2 RELATED REQUIREMENTS

- A. Section 01 33 00 Submittals.
- B. Section 32 31 13 Chain Link Fences and Gates.

1.3 REFERENCES

- A. International Fire Code (IFC), Section 3404.
- B. National Fire Protection Association, No. 704.
- C. State of Alaska, Department of Transportation, "Standard Specification for Highway Construction" and "Standard Drawings Manual".

1.4 SUBMITTALS

- A. Submit shop drawings of all signs, including height and width as well as sign thickness. Indicate background color and text color, text information (i.e. height and stroke) proposed for each sign.
- B. Submit manufacturer's data and standard colors for vinyl backgrounds and letters.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Signs shall be constructed of 0.08" minimum aluminum plate with either red reflective or black letters on a white non-reflective background, unless otherwise indicated.
- B. Size signs and lay out letters such that no letters touch or overlap, and all words are clearly readable.
- C. Size letters as indicated on the Contract Drawings and adjust size of sign accordingly, or make sign the dimensions indicated and size text appropriately to fit within the available space.

- D. Provide 3M series 255 High Performance vinyl letters on 3M 3650-10 white vinyl background, or Gerber thermal transfer film printed letters on Gerber High Performance vinyl background as indicated on the Drawings, or as appropriate for the application.

2.2 SIGNS

- A. Provide signs as indicated on the Contract Drawings.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install in accordance with IFC flammable and combustible liquid signage standards, and NFPA.
- B. Signs shall be conspicuously mounted and easily read.
- C. Where signs are fastened to fences, the fasteners used shall be galvanized steel hog rings or wire ties.

END OF SECTION

SECTION 11 95 13

SPILL RESPONSE EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section includes spill response equipment for the Community bulk fuel facilities.
- B. Spill response storage is in CONTRACTOR provided connexs and overpack drums, see Contract Drawings for locations and additional information.

1.2 REFERENCES

- A. United States Department of Labor, Occupational Safety and Health Administration (OSHA):
 - 1. 29 Code of Federal Regulations (CFR) 1910

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submit manufacturer's data for all spill response equipment and supplier for each item. Group item by each supplier.
- C. Unless otherwise indicated alternate manufacturers will be acceptable as long as they supply similar equipment with the same quality and performance.
- D. All equipment and materials shall be new unless indicated otherwise.

1.4 GENERAL

- A. CONTRACTOR is responsible for providing spill response equipment as specified and in accordance with this Section.
- B. Submit manufacturer's data for all spill response equipment and supplier for each item. Group item by each supplier.
- C. Place smaller items inside overpack drums. If items will not fit within 3 overpack drums then Contractor shall provide additional drums as necessary.
- D. Permanently label all overpack drums "SPILL RESPONSE KIT" with minimum 3-inch high letters.
- E. Place all spill response equipment, including overpack drums, inside Connexes.

- F. Contractor shall finish the interior of the Connex to provide shelving as required to adequately store, organize and support the specified spill equipment, extra facility parts and associated facility tools.

PART 2 - PRODUCTS

2.1 SPILL RESPONSE EQUIPMENT

- A. Provide all spill response equipment as specified in this section or as noted on the Contract Drawings.
- B. Spill response Connex shall be standard 20 foot long shipping containers, steel construction, not insulated. Connexes shall be in like new condition but need not be new. Connex doors shall operate freely without binding or excessive resistance, and connex exterior shall have minimal rust. Any rust shall be wire wheeled to clean metal, primed and painted.
- C. **Provide one set of the following equipment and materials and place within CONTRACTOR provided spill response connex.**

Quantity	Item/Description
Absorbent Material and Containers	
3 EA	Overpack Drums, 95 Gallon Poly
1 EA	Open-top Drum, 55 Gallon, Metal
2 EA	Absorbent Roll, min. 30"x140', min. absorb 50 gal/bale
2 EA	Absorbent Pads, min. 16"x20", 100 Pieces Ea, min. absorb 24 gallons/bale
13 EA	Absorbent Boom, min. 6" x 40', min. 100 gal/40'
2 EA	Absorbent Sweep, 19" x 100', min absorb 25 gal/bale
Personnel Protective Equipment	
4 Pair	Gloves, Nitrile AF18 Chem-Resist, Pairs
4 EA	Tyvek Suits, XL Polyethylene Coated, zipped front, elastic wrist and ankle
4 EA	Goggles, UVEX Futura
4 EA	Hardhats, Bullard Traditional, with 6-point ratchet suspension, orange
Recovery Equipment	
1 EA	3500 gallon Fold-A-Tank
1 EA	2-inch portable centrifugal pump, gas-powered Goulds 2AM32-P rated at 140 gpm with 2" camlocks. Pre-Approved Alternate: (Option #2: Homelite #320 rated at 140 gpm with 2" camlocks)
1 EA	Discharge Hose with 2" camlocks, 100' total length
1 EA	Suction Hose with 2" camlocks, 50' total length
2 EA	Shovel, square point, wood handle
2 EA	Rake, 16-tine forged bow, wood handle
2 Roll	Garbage/Disposal Bags, heavy duty, 100ct./roll, 33-gal., 4-mil, printed "Oily Waste"
Miscellaneous	
1 EA	Smart Ash Incinerator

8 EA	Fire Extinguishers, Portable, Type 4A-80BC
1 EA	Connex, 20 foot, lockable
10 EA	Padlocks, keyed-alike

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place concrete foundations as indicated in the design drawings.
- B. Install and secure connex, deck and stairs.
- C. Place spill response items in overpack drums and on Contractor provided shelves inside connex. Shelving must be sufficiently strong to hold specified equipment, spare facility parts and associated tools.

END OF SECTION

SECTION 26 00 00

ELECTRICAL METHODS AND MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION AND RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.Á
- B. This Section applies to Division 26 and is part of all other Division 26 Sections.Á
- C. Related sections include Div 33 and Div 40Á

1.2 SCOPE

- A. Provide labor, products and services required for the complete installation, checkout and startup of all systems shown and specified.Á
- B. Where the work of several crafts is involved, coordinate related work to provide each system in complete and in proper operating order.Á
- C. Cooperate with others involved in the project, with due regard to their work, to promote rapid completion of the entire project.Á
- D. Local Conditions: The Contractor shall thoroughly familiarize himself with the work as well as the local conditions under which the work is to be performed. Schedule work with regard to seasons, weather, climatic conditions and other local conditions which may affect the progress and quality of the work.Á
- E. Utility Coordination: Coordinate work with the serving utilities (electric, telephone (Cell and Landline), etc.) and provide equipment and installation in accordance with the respective utility requirements. Meet with the serving utilities and coordinate the installation and location of the services. Provide a written statement of approval from each serving utility.
- F. Provide commissioning services as specified in Division 01 and 26 08 00 –Á
Commissioning of Electrical and Control Systems.Á

1.3 CODES AND STANDARDS

- A. Codes: Perform work in strict accordance with applicable national, state and local codes; including, but not limited to the latest legally enacted editions of the following specifically noted requirements:Á

1. NFPA 70, National Electrical Code - NEC.
 2. ANSI-C2, National Electrical Safety Code - NESC.
 3. International Building Code - IBC.
 4. International Fire Code - IFC.
 5. Underwriters Laboratory (UL) or approved equal.
- B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:
1. American National Standards Institute - ANSI.
 2. American Society for Testing and Materials - ASTM.
 3. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE(Standard 90-75).
 4. Institute of Electrical and Electronics Engineers - IEEE.
 5. Insulated Cable Engineers Association - ICEA.
 6. National Electrical Manufacturers' Association - NEMA.
 7. National Fire Protection Association - NFPA.

1.4 MATERIAL QUALITY CONTROL

- A. All components, systems and assemblies (i.e.: Control Panels) shall be Listed or Labeled by and Agency acceptable to the State of Alaska Department of Labor, Mechanical Inspections Division. Acceptable Agencies include (but are not limited to) U/L, ETL, FM, CSA/US.
- B. It is the CONTRACTOR's responsibility to verify listing or labeling of all components for which he is responsible for. Any component, system or assembly installed under this contract that is found not to be listed or bear a label will be either replaced or field listed and any associated cost shall be borne in its entirety by the CONTRACTOR.

1.5 SPECIFICATION TERMINOLOGY

- A. "Engineer" is the Owner's Representative as defined in the General Conditions of the Contract.
- B. Streamlining: In many instances, the products, reference standards, and other itemized specifications have been listed without verbiage. In these cases, it is implied that the Contractor shall provide the products and perform in accordance with the references listed.
- C. "Provide" means furnish all products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.

- D. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere as noted or agreed to be installed by supporting crafts.
- E. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
- F. "Rough-in and connect" means provide an appropriate system connection such as conduit with junction boxes, wiring, switches, disconnects, etc., and wiring connections. Equipment furnished is received, uncrated, assembled, and set in place under the Division in which it is specified.
- G. "Accessible" means arranged so that an appropriately dressed man, 6 feet-2 inches tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended and may then position himself to properly and safely perform the task to be accomplished, without disassembly or damage to the surrounding installation.
- H. "Serviceable" means arranged so that the component or product in question may be properly removed, and replaced without disassembly, destruction or damage to the surrounding installation.
- I. "Product" is a generic term, which includes materials, equipment, fixtures and any physical item used on the project.
- J. "Basis of Design" refers to products around which the design was prepared. Some or all of the particular characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as switchboards that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving all impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and all Codes.
- K. "As Specified" denotes a product, system, or installation that:
 - 1. Includes all of the salient characteristics identified in the Drawings and Specifications;
 - 2. Meets all of the requirements of the "Basis of Design"; and
 - 3. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.
- L. "Substitution" is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Contract Documents, but which the Contractor warrants meets all specific requirements listed in the Contract Documents.

- M. "System Drawing" is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the products interact to accomplish the function intended. Examples of system drawings include control and instrumentation diagrams, and wiring diagrams. Some drawings, such as dimensioned and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.
- N. "Shop Drawings" are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and complete coordination of all trades.
- O. Reference to a specific manufacturer's product (even as "Basis of Design") does not necessarily establish acceptability of that product without regard to compliance with all other provisions of these specifications.

1.6 DRAWINGS SPECIFICATIONS AND SYMBOLS

- A. The Drawings and specifications are complementary. Do not scale the Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
- B. The Drawings are partly diagrammatic and do not show precise routing of conduits or exact location of all products, and may not show in minute detail all features of the installation; however, provide all systems complete and in proper operating order.
- C. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations, or called for on the Drawings or in the specifications.

1.7 PRODUCT AND SYSTEM SUBMITTALS

- A. Submittals: Provide submittals for products and systems described in Division 26 and shown on the Drawings to demonstrate compliance with the requirements of the project. Unless specified otherwise in Division 1, submit data not later than 60 days after award of contract or, in any case, to allow sufficient time for review without delaying construction. Furnish equipment submittals in the manner described elsewhere in these specifications. In addition, include data for review, and organize data, as noted below:
 - 1. Specification reference and/or drawing reference for which literature is submitted for review with an index, following specification format, and item by item identification.
 - 2. Manufacturer's name and address, and supplier's name, address and telephone number.
 - 3. Catalog designation or model number.
 - 4. Rough-in data and dimensions.
 - 5. Operation characteristics.
 - 6. Wiring diagrams for the specific system.
 - 7. Coordination data to check protective devices.

8. Information required to verify compliance with the short-circuit withstand and interrupting ratings, as shown on the Drawings or further stated in these Specifications.
9. Certification that all data shown on the Drawings or further stated in these Specifications concerning available short-circuit currents has been confirmed with the serving Electric Utility.
10. Working construction drawings (shop drawings).
11. A customized listing of the characteristics identified in the Contract Documents. Indicate whether each item is submitted as "Basis of Design", "As Specified" or "Proposed Substitution". Clearly indicate on product data sheets the data which show the product meets the requirements. Indicate all deviations and mark out all non-applicable items.
12. ALL PROPOSED SUBSTITUTIONS, DEVIATIONS, MODIFICATIONS, OR CHANGES OF ANY TYPE WHATSOEVER FROM THE PRODUCTS OR SYSTEMS SPECIFIED SHALL BE CLEARLY ITEMIZED IN THE SUBMITTAL INDEX. Submittal approval will not include such deviations unless they are specifically itemized and approved. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor and accepted by the Engineer, provision of a complete and satisfactory working installation of equal quality to system specified is the sole responsibility of the Contractor. Unapproved deviations discovered in the field shall be corrected as directed by the Engineer.
13. DELETE ALL SUPERFLUOUS INFORMATION FROM SUBMITTAL DATA SUCH AS MODEL NUMBERS AND OPTIONS FOR EQUIPMENT CONTAINED ON MANUFACTURER'S DATA SHEETS BUT NOT USED ON THIS PROJECT.
14. Submittals not completely marked as indicated above, in the opinion of the Engineer, will be rejected without review.

B. Electronic Submittals:

1. Submittals may be in electronic (PDF) format.
 - a. Electronic submittals shall follow the organization and formatting required for paper submittals.
 - 1) Provide electronic bookmarks within the PDF document in place of tabs and sub-tabs.
 - 2) If individual PDF files are provided for each product or shop drawing sheet, organize files into folders and name files and folders to correspond with applicable specification sections or drawing titles.
 - b. If submittal is a scanned document, run the optical character recognition OCR function to ensure the document is searchable and can be copied and pasted.
 - c. Electronic submittals may be transmitted via Email, disk or download from a projector construction Website.

C. Coordination:

1. The Contractor shall create and maintain a master submittal log for all items submitted in Division 26. Submit master submittal log with first submittal.

2. Prior to submission for approval, the Contractor shall hold a meeting of all trades to review all shop drawings and submittals. All trades shall cross-check all shop drawings and submittals for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.
3. The Contractor shall revise, correct, and appropriately annotate all submittals prior to submission for approval.

D. Certificate of Coordination: Include with the Submittals a complete letter in the following format:

I _____ (Name), of
_____ (Firm), certify that the meeting of all trades for coordination of shop drawings and submittals as required by Specifications Section 26 00 00 - Electrical Methods and Materials was held on _____ Date(s). I further certify that, except as noted on the shop drawings and submittals, they are free of conflicts, discrepancies, dimensional errors, omissions, contradictions, and departures from the Contract requirements, and that they provide for proper clearances, physical space allocation and routing, correct electrical/mechanical services and connections, and provisions for commissioning.

SIGNED: _____ DATE: _____

_____ TITLE: _____

- E. A current copy of all approved submittals and the submittal log shall be kept at the job site.
- F. With prior permission from the Engineer, partial submittals will be considered for review provided that they are complete sections, as listed below:
1. Individual Special Systems (Fire Alarm, Intercom, etc.)
 2. Lighting Fixtures, Lamps and Accessories.
 3. Switchboards, Panels and Transformers.
 4. Transfer Switches
 5. Transformers.
 6. Controls and Instrumentation
- G. Mark submittal literature and shop drawings clearly and bind 8-1/2 by 11 inch literature in three-ring hardback loose-leaf binders by individual sets.
- H. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment.

1.8 SHOP DRAWINGS REQUIRED

- A. The Contract Documents are not intended for nor are they suitable for use as shop drawings. Do not use Contract Drawings for direct fabrication or installation of products or equipment; instead, prepare shop drawings for installation and arrangement of work. Submit shop drawings as requested, specified, or otherwise required demonstrating proper planning for installation and arrangement of work to the satisfaction of the Engineer. Lay out drawings to scale and show dimensions where accuracy of location is necessary for coordination or communication purposes. Scale shall be appropriate to clearly show all aspects of installation and equipment arrangement. Show work of all trades, including Architectural, Structural, Mechanical, and Electrical items which are pertinent to proper and accurate coordination and conflict resolution.
- B. In cases where one or more equipment items in a mechanical or electrical room or space differ in dimensions or configuration from Basis of Design equipment, the working drawing shall show the entire area. The drawing shall be dimensioned to indicate that required aisle ways and maintenance clearances are being maintained to at least the degree shown on the Contract Drawings.
- C. Provide shop drawings for all products, systems, system components, and special supports that are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor. In addition provide shop drawings for:
 - 1. Electrical and telecommunications rooms and spaces, including all equipment. Demonstrate all required clearances and working spaces are provided.
 - 2. Routing and interdisciplinary coordination of groups of conduits numbering more than one and over two inch trade size.
 - 3. Where noted on the drawings.
 - 4. Where noted in Division 26.
- D. Record Shop Drawings: Provide a copy of the final, corrected, approved shop drawings for the project, updated to show as-built conditions. Drawings shall indicate exact device locations and conduit and wire routing. Prepare drawings using the latest release of AutoCAD and deliver files to the Engineer. Refer to other specification sections for additional system specific requirements.

1.9 PERMITS, TESTS AND INSPECTIONS

- A. Schedule, obtain, and pay for permits and fees required by local authorities and by these specifications.
- B. Request for Tests: Notify the Engineer a minimum of 72 hours in advance of tests. In the event the Engineer does not witness the test, certify in writing that all specified tests have been made in accordance with the specifications.
- C. Deficiencies: Immediately correct deficiencies that are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal electrical installations until satisfactory tests are made and approved.

- D. Operating Tests: Upon request from the Engineer, place the entire electrical installation and/or any portion thereof, in operation to demonstrate satisfactory operation.

1.10 IDENTIFICATION

- A. Equipment Labels and Nameplates:
1. Provide rigid engraved labels and nameplates of 1/16 inch thick laminated plastic.
 - a. Label and Nameplate Colors:
 - 1) Normal Equipment: White letters on a black or gray background (engraved labels).
 - 2) Emergency Equipment: White letters on a red background.
 - b. Securely attach labels with threaded fasteners or pop-rivets. (Adhesive attachment not acceptable.)
 - c. Temporary markings not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.
 - d. No labeling abbreviations will be permitted without prior approval.
 2. Include item designation and branch circuit designation (panel and circuit number) on disconnects, starters, equipment and device nameplates, e.g., "AHU-2, Circuit LA-30").
 3. Label and Nameplate Locations:
 - a. Provide 1 inch minimum height letters on following equipment:
 - 1) Service disconnect (red background).
 - b. Provide 1/2 inch minimum height letters on following equipment:
 - 1) Secondary feeder breakers in distribution equipment. Designation as required by load served.
 - 2) Special equipment housed in cabinets, as designated on plans, on outside of door.
 - 3) Panelboards, switchboards, motor control centers, as designated on plans, on outside of door.
 - 4) Service equipment. Provide signage in accordance with NEC Article 110.24(A) indicating maximum available fault current and date of fault current calculation.
 - c. Provide 1/4-inch minimum height letters on:
 - 1) Disconnects and starters for motors or fixed appliances.
 - 2) Designated electrical equipment.
 - d. Provide 1/8-inch minimum height, adhesive labels on switches and receptacles where item controlled is not visible from the switch, or as noted on drawings.
 - e. External Power Sources: Provide 1/8-inch white letters on red background on all starters or controllers that receive power from an external source that is not de-energized by operating the associated disconnecting means.
- B. Branch Circuit Panelboard Directories: Provide neatly typed schedule (odd numbered circuits on left side or top, even on right side or bottom) under plastic jacket or protective cover to protect the schedule from damage or dirt. Securely mount on inside face of

panelboard door. Define briefly, but accurately, nature of connected load (i.e., Lighting Room 2989, Receptacles Janitor Room, Etc.) as approved. Sequentially numbered schedules shall not be used.

- C. One-Line Diagram: Provide approved print for the "As-Built" distribution system. Mount behind protective cover (1/8-inch minimum thickness clear Plexiglas) in substantial frame, in accessible location at main switchboard.
- D. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits provided for future equipment.
- E. Conduits: Mark conduits entering or leaving panelboards with indelible black magic marker with the circuit numbers of the circuits contained inside. Identify Fire Alarm System conduits with red paint in accordance with Section 26 05 34 Raceway and Boxes for Electrical Systems.
- F. Junction Boxes: Mark the circuit numbers of wiring on junction boxes with sheet steel covers. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover. Paint Fire Alarm System junction boxes with sheet steel covers red. Mark other Special System junction boxes with sheet steel covers with appropriate system designation, e.g., "Intercom", "Clock", "Telecom", etc. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover.
- G. Code Required Markings and Warnings: Provide placards, markings and identification systems required by Code and/or the Contract Documents, such as (but not limited to):
 - 1. Arc Flash.
 - 2. "Series Rated Systems".
 - 3. Conductor insulation color identification.
 - 4. Special conductor identification and legends.
 - 5. Emergency systems markings.
 - 6. Multiple services placards.
 - 7. Emergency source grounded circuit conductor connected to a grounding electrode at a location remote from the emergency source: Provide a sign at the grounding location identifying all emergency and normal sources connected at that location.
 - 8. Warning messages shall include an appropriate plain language imperative command, such as "DANGER HIGH VOLTAGE - KEEP OUT"
 - 9. Available Fault Current: Service equipment shall be legibly marked in the field with the maximum available fault current in accordance with NEC Article 110.24(A). The field marking(s) shall include the date the fault calculation was performed and shall be of sufficient durability to withstand the environment involved." Development of the actual fault current will be a joint effort between Contractor and Engineer. Final values will be provided by the Engineer, however field data may be requested from and provided by Contractor.
 - 10. Where disconnecting means is not within sight of the transformer, provide signage in accordance with NEC Article 450.14 indicating location of remote disconnecting means.

1.11 CLEARANCE STRIPING

- A. For electrical equipment located in areas with uncarpeted floors, the clearances dictated by NEC Article 110 shall be indicated by two inches wide colored striping on the floor.
- B. Striping shall be of a bright color (typically red or yellow) that contrasts with the floor color, and shall be applied by the most durable process that is commercially available for the particular floor finish. Examples are: epoxy paint on concrete floors, and colored tile segments in composition tile floors. Striping color and method shall be subject to approval by the Engineer.
- C. Where practical, on the floor immediately inside the striping, stencil in two inch block letters the statement: "ELECTRICAL CLEARANCE -- STORAGE ILLEGAL INSIDE THIS ZONE." For floor types where painted stenciling is not feasible or sufficiently durable, this message shall instead be posted with a WALL PLACARD below the equipment of the type specified in this Section, with 1/2-inch lettering. Note the specific clearance requirements on the engraved label. Placard shall be of a size needed to provide the required information. Color shall be black letters and symbols on yellow background.
- D. A placard placed at either end of a contiguous row of equipment is acceptable where floor marking is not feasible.

1.12 AS-BUILT DRAWINGS

- A. Reference requirements stated elsewhere in these Specifications.
- B. In addition to other requirements, mark up a clean set of drawings as the work progresses, to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing and location of items cast in concrete or buried underground. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.
- C. Maintain As-Built Drawings in an up-to-date fashion in conjunction with the actual progress of installation. Accurate progress mark-ups shall be available on-site for examination by the Engineer or his representative at all times.
- D. Prepare wiring diagrams for individual special systems as installed. Identify components and show wire and terminal numbers and connections. Include diagrams from the shop drawings and submittals, updated to show as-built condition.
- E. Contractor's red lines ("As-Builts"), shall be prepared in accordance with to the standard of care criteria as defined in this sub-section. The Engineer reserves the right to reject any or all such As-Built Drawings if, in our opinion, these criteria have not been met or if the work is not clear. Costs incurred as a result of the Contractor's failure to meet these criteria such as, but not limited to, resubmittals, meetings, site visits and written correspondence, shall be reimbursed by the Contractor as additional services. The acceptable standard of care includes the following:

1. Full size As-Built Drawings shall be neatly marked-up by the Contractor to show actual installation conditions using the symbols, line types and abbreviations as shown in the contract document's legends and abbreviations. Red shall be used to show items to be added, green for items to be removed and blue for general clarification comments not to be drafted.
 2. Line work shall be drawn using a straight edge and all notes shall be neatly printed and legible. Leaders and sheet notes shall be used where necessary using a similar style to that shown throughout the Drawings.
 3. Under slab and otherwise inaccessible piping, ducting, and other components shall be accurately dimensioned to the nearest one-inch increment. Complete and submit As-Built Drawings that include inaccessible components, such as plumbing and heating piping and electrical conduit on underfloor plans involving slab on grade floor construction, for review prior to pouring of the slab.
 4. Where equipment is furnished having different dimensions than those shown, the Drawings shall be modified to show the dimensions of the equipment provided.
 5. Where equipment is shown in more than one drawing location, (i.e., plan and section), revised equipment arrangement shall be shown in all drawing locations.
- F. At completion of project, deliver the As-Built Drawings to the Engineer and obtain written receipt.

1.13 OPERATING INSTRUCTIONS

- A. Prior to final acceptance, instruct an authorized representative of the Owner for eight hours on the proper operation and maintenance of electrical systems and equipment provided under this contract. This requirement is for several systems, and is in addition to special training specified in other sections. Make available a qualified technician for each component of the installation for this instruction. Give these operating instructions after the operation and maintenance manuals have been furnished to the Owner. Submit written certification, signed by the Contractor and an authorized representative of the Owner, that this has been completed.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Provide Operation and Maintenance Manuals in the manner described elsewhere in these specifications. In addition, organize manual and include data and narrative as noted below.
1. Final Manuals shall be provided not later than one week prior to requesting inspection for Substantial Completion.
 2. Submit all 8-1/2 by 11 inch literature and equipment data in hard-back, three-ring, loose leaf binders by individual sets. Cardboard or paper binders are unacceptable.
 3. Provide electronic format (Adobe PDF) files for Operation and Maintenance Manuals.
- B. Provide a separate chapter for each section of the electrical specifications with sub-chapters for each class of equipment or system. Provide a table of contents for each

chapter, and each major item in each chapter, to indicate the page number of each. Provide a summary of product warranty terms and duration for each piece of equipment. Label all pages to assure correct placement in manual. Identify each piece of equipment with its associated specification description.

- C. Operating Sequence Narrative:
 - 1. In each chapter, describe the procedures necessary for personnel to operate the system and equipment covered in that chapter.
 - 2. Describe procedures for start-up, operation, emergency operation, and shutdown of each system. If a particular sequence is required, give step-by-step instructions in that order.
 - 3. Describe all seasonal adjustments that should be accomplished for each system.
 - 4. Provide the above descriptions in typewritten, simple outline, narrative form.
- D. Maintenance Instructions:
 - 1. Provide complete information for preventive maintenance for each product, including recommended frequency of performance for each preventive maintenance task.
 - 2. Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and which require no extensive special training or skills.
 - 3. Provide information of a maintenance nature covering warranty items, etc., that are not discussed in the manufacturers literature or the operating sequence narrative.
 - 4. Provide complete information data for spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
- E. Manufacturers' Brochures: Include manufacturers' descriptive literature covering products used in each system, together with illustrations, exploded views and renewal parts lists. Highlight all applicable items and instructions, or mark-out non-applicable items.
- F. Shop Drawings: Provide a copy of corrected, approved shop drawings for the project, updated to show as-built condition, either with the manufacturers' brochures or properly identified in a separate subsection.
- G. Operation and Maintenance Manuals shall be fully corrected to include review comments prior to final submission to the Owner.

1.15 PROJECT COMPLETION AND DEMONSTRATION

- A. Tests: During final inspection, conduct operating tests for approval. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply. Have instruments available for measuring light intensities, voltage, and current values and for the demonstration of continuity, grounds, or open circuit conditions. Furnish personnel to assist in taking measurements and making tests.

In the event that systems are not complete and fully operational at the time of final inspection, all costs of any subsequent inspections shall be borne by the Contractor at no additional cost to the Owner.

- B. Certificate of Completion: Submit at time of request for final inspection, a complete letter in the following format:

I, (Name), of (Firm), certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies of which are attached hereto) and will be ready for final inspection as of (Date). I further certify that the following Specifications requirements have been fulfilled:

1. Megger readings performed, copies of logs attached.
2. Operating manuals completed and instruction of operating personnel performed, (Date) (Signed) Owner's Representative
3. Record document drawings up-to-date, accurate, and ready to deliver to Engineer.
4. Emergency systems tested and fully operational.
5. Alarm System tested and fully operational.
6. Generation System controls tested and fully operational.
7. Ground-fault system performance test complete, copies of logs attached.
8. Other tests required by Specifications have been performed.
9. Specified Owner training complete.
10. Systems are fully operational. Project is ready for final inspection.

SIGNED:

DATE:

TITLE:

1.16 WARRANTY

- A. Warranty work shall be promptly coordinated and performed at the Contractor's sole expense. Workmanship, labor and materials (without limitation) in this Division shall be warranted for the longer of the following:
1. As called for in the General Conditions of the Contract.
 2. For a minimum period of one year from the date of final acceptance.
 3. For the extended warranty period specified in a specific Section under this Division.
- B. Where a specific product carries a longer warranty as a standard offering of its manufacturer, extended warranty coverage beyond these requirements shall be retained by the Owner. The Owner will have recourse back to the manufacturer only in these cases, when the warranty as specified in A. above has expired.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Electrical Material have been called out on the plans and unless specifically noted are all considered to be candidates for OR EQUAL substitution.

2.2 NAMEPLATES

- A. Product Description: Engraved three-layer laminated plastic nameplate, black letters on white background.

2.3 WALL PLACARDS

- A. Product Description:
 - 1. ,080 Aluminum
 - 2. Single sided
 - 3. Minimum size: 12"x18"

2.4 WIRE MARKERS

- A. Product Description: split sleeve, or tubing type wire markers with circuit or control wire number permanently stamped or printed.

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. EPDM: Ethylene-propylene-dieneterpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

- A. Product Data: For each type of product provided.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Southwire Company.
 - 4. Alcan Wire.
- B. Copper Conductors: Stranded, comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. O-Z/Gedney; EGS Electrical Group LLC.
 - 2. 3M; Electrical Products Division.

3. Tyco Electronics Corp.
 - B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- 2.3 Specialty Cords and Cables**
- A. Provide Manufacturer approved cords and cable as shown on the plans.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. All conductor sizes #3/0 AWG and larger are based on Aluminum unless specifically noted as Copper.
- B. Feeders: Stranded Copper and Stranded Aluminum.
- C. Branch Circuits #6 AWG and smaller: Stranded Copper.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type XHHW-2 single conductors in raceway.
- B. Feeders: Type XHHW-2 single conductors in raceway.
- C. Branch Circuits: Type THHN-THWN, single conductors in raceway.
- D. Minimum Conductor Size:
 1. Neutral: #10 AWG (#12 AWG minimum for dedicated neutrals and lighting circuits).
 2. Ground: #12 AWG.
 3. Phase Conductors (more than six in a raceway): #10 AWG.
 4. Phase Conductors (six or less in a raceway): #12 AWG.
 5. Branch Circuit Homeruns (longer than 75 feet): #10 AWG.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application.
- F. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- G. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Provide insulated screw-on type connectors on lighting and receptacle branch circuit splices. Hydraulically-set compression lugs for terminations at panel and switchboard busses.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- D. Below-grade splices shall be made in handholes and shall be made watertight with epoxy resin type splicing kits. Scotchcast or equal.
- E. Termination at busses (panel, switchboard, ATS, etc.), and transformers to be made with hydraulically set compression lugs.

3.5 BRANCH CIRCUITS

- A. Homeruns greater than 75 feet to first outlet shall be No. 10 AWG minimum. Make no splices in home runs. Wiring from separate raceway systems shall not be intermixed in common junction boxes. Wiring shown in separate raceway systems shall not be combined.

3.6 FEEDERS

- A. Make no splices unless shown on the plans.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product provided.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Stranded Copper wire or cable insulated for 600 V.
- B. Bare Copper Conductors: Stranded Copper wire or cable.
- C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches by 12 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

- A. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad, 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Grounding Bus: Install in electrical and telecommunications equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- D. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 3. Connections to Structural Steel: Welded connectors.

3.2 BONDING

- A. Insulated grounding bushings shall be installed to bond all feeder conduits to the switchboard ground bus or panel ground bus at both ends of feeder raceways. Insulated grounding bushings shall also be installed in all feeder pull boxes to bond all conduits together. Jumpers or bonds shall be copper and sized in accordance with Table 250-95 of the National Electrical Code.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- B. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.
- C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- C. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
- E. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables.
 - 2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway and boxes to complete wiring system.

1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 1/2 inch unless otherwise specified.

1.5 SUBMITTALS

- A. Section 26 00 00 - Electrical Methods and Materials.
- B. Product Data: Submit for the following:
 - 1. Flexible metal conduit.
 - 2. Liquidtight flexible metal conduit.
 - 3. Nonmetallic conduit.
 - 4. Flexible nonmetallic conduit.
 - 5. Nonmetallic tubing.
 - 6. Raceway fittings.
 - 7. Conduit bodies.
 - 8. Surface raceway.
 - 9. Wireway.
 - 10. Pull and junction boxes.
 - 11. Handholes.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 77 16 - Closeout Requirements
- B. Project Record Documents:
 - 1. Record actual routing of conduits larger than 2 inch.
 - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 13 – Material and Equipment.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

1.8 COORDINATION

- A. Coordinate installation of outlet boxes for equipment connected under Section 26 05 33.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit.
 - 2. EGS/Appleton Electric.
 - 3. Republic Conduit.
 - 4. Thomas & Betts Corporation; a member of the ABB Group.
 - 5. Western Tube and Conduit Corporation.
 - 6. Wheatland Tube Company.
 - 7. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Rigid Aluminum Conduit: ANSI C80.5.
- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB 1; [material to match conduit.] [furnish aluminum fittings with steel conduit.] [all steel fittings.]

2.2 PVC COATED METAL CONDUIT

- A. Manufacturers:
 - 1. Robroy Industries.
 - 2. Thomas & Betts Corporation; a member of the ABB Group.
 - 3. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Southwire Company.
 - 4. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description: Interlocked aluminum construction.
- C. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. Anamet Electrical, Inc.
 - 2. Carlon Electrical Products.
 - 3. EGS/Appleton Electric.
 - 4. Southwire Company
 - 5. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description: Interlocked aluminum construction with PVC jacket.
- C. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Emerson Process Management.
 - 3. Republic Conduit.
 - 4. Western Tube and Conduit Corporation.
 - 5. Wheatland Tube Company.
 - 6. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression type.
- D. Set screw or indenter type fittings and conduit bodies not permitted.

2.6 NONMETALLIC CONDUIT

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. ENDOT
 - 3. EGS/Appleton Electric.
 - 4. Hubbell Premise Wiring..
 - 5. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description:
 - 1. PVC: NEMA TC 2; Schedule 40 or 80 PVC as indicated on plans. If not indicated than SCH 80 is to be used.
 - 2. HDPE: UL 651-A, ASTM F 2160
- C. Fittings and Conduit Bodies: NEMA TC 3.

2.7 NONMETALLIC TUBING

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Hubbell Premise Wiring.
 - 3. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Product Description: NEMA TC 2.
- C. Fittings and Conduit Bodies: NEMA TC 3.

2.8 FLEXIBLE COUPLINGS FOR HAZARDOUS LOCATIONS

2.9 SEAL OFF FITTINGS

2.10 WIREWAY

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Cooper B-Line, Inc.; a division of Cooper Industries.
 - 3. Hammond Mfg. Co. Inc.
 - 4. Hoffman; a brand of Pentair Equipment Protection.
 - 5. Panduit Corp.
 - 6. Square D; by Schneider Electric.
 - 7. Wiremold / Legrand..
 - 8. Substitutions: Section 26 00 00 - Electrical Methods and Materials

- B. Product Description: Oiltight and dust-tight type wireway.
- C. Knockouts: Manufacturer's standard.
- D. Size and length as indicated on Drawings. If not shown, provide 6x6 wireway, length as required.
- E. Cover: Hinged cover with full gaskets.
- F. Connector: Flanged.
- G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.
- H. Finish: Rust inhibiting primer coating with gray enamel finish.

2.11 OUTLET BOXES

- A. Manufacturers:
 - 1. Allied Moulded Products, Inc.
 - 2. Carlon Electrical Products.
 - 3. Emerson Electric Co.
 - 4. RACO; Hubbell..
 - 5. Substitutions: Section 26 00 00 - Electrical Methods and Materials.
- B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- C. Nonmetallic Outlet Boxes: NEMA OS 2.
- D. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- E. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.12 PULL AND JUNCTION BOXES

- A. Manufacturers:
 - 1. Emerson Process Management.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. Kraloy.
 - 4. RACO; Hubbell..
 - 5. Substitutions: Section 26 00 00 - Electrical Methods and Materials.

- B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4X; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Fiberglass Concrete composite Handholes: Die-molded, glass-fiber concrete composite hand holes:
 - 1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
 - 2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway. Cut raceway flush with walls and floors, and patch surfaces.
- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- E. Extend existing raceway and box installations using materials and methods as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Identify raceway and boxes in accordance with Section 26 05 53.

- C. Arrange raceway and boxes to maintain headroom and present neat appearance.
- D. Underground more than 5 feet outside Foundation Wall or structure: Provide HDPE with plastic coated rigid sweeps and risers. Provide cast metal boxes or nonmetallic handhole.
- E. Underground within 5 feet from Foundation Wall and below slab when entering from exterior: Provide plastic coated rigid conduit. Provide cast metal boxes or nonmetallic handhole.
- F. In Slab on Grade: Provide rigid steel conduit, intermediate metal conduit. Provide cast or metal boxes.
- G. Outdoor Locations, above grade: Provide rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.
- H. In Slab Above Grade: Provide rigid steel conduit, intermediate metal conduit. Provide cast boxes.
- I. Wet and Damp Locations: Provide rigid steel conduit, intermediate metal conduit, electrical metallic tubing where allowed by code. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
- J. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes with access. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- K. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

3.4 RACEWAY GENERAL

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Provide conductive lubricant when installing threaded conduits.
- C. Route conduits along with piping systems: share supports and trenches wherever possible.
- D. Arrange raceway supports to prevent misalignment during wiring installation.
- E. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

- G. Do not attach raceway to ceiling support wires or other piping systems.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping systems to allow maintenance on either without removing the other system.
- L. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- P. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- Q. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- R. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- S. Install fittings to accommodate expansion and deflection where raceway crosses, control and expansion joints.
- T. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- U. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- V. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings (notes or elevations) unless specified in section for outlet device.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.

- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- D. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- E. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- F. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- G. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- H. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- I. Install adjustable steel channel fasteners for hung ceiling outlet box.
- J. Do not fasten boxes to ceiling support wires or other piping systems.
- K. Support boxes independently of conduit.
- L. Install gang box where more than one device is mounted together. Do not use sectional box.
- M. Install gang box with plaster ring for single device outlets.
- N. Outdoor Locations: Install liquidtight flexible metal conduit not more than 36" at all risers to above grade junction boxes to allow for thermal expansion.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

- A. Section 01 77 19 – Closeout Requirements.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

- A. Section 01 77 19 - Closeout Requirements
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

- A. Product Data: For each electrical product in the system shown on the drawings and in these specifications.

PART 2 - PRODUCTS

2.1 RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
 - 1. Power Circuits: White letters on a black field.
- C. Legend: Indicate system or service and voltage, if applicable.
- D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable. Uses permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
- B. Compounded for permanent direct-burial service.
- C. Embedded continuous metallic strip or core.
- D. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
- D. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.5 EQUIPMENT NAMEPLATES

- A. General: Nameplates shall be engraved in 1/16 inches thick phenolic letters, a minimum of 3/16 inches high with white letters on black background for all equipment and signal and communications systems except fire alarm. Provide white letters on a red background for fire alarm.
- B. Mounting: Nameplates shall be attached with a minimum of two 6-32 roundhead screws, lockwasher and nuts in exterior locations and contact-type permanent self-adhesive in indoor locations.

2.6 SWITCHBOARDS AND DISTRIBUTION PANELBOARDS

- A. General: Provide nameplate which identifies the switchboard/distribution panel and the source panel. (Example: Distribution Panel No. 1/Fed from Main Service Switchboard - Bkr. No. 1.)
- B. Overcurrent Devices: Provide nameplate at each overcurrent device that identifies the device number and the load served. (Example: Bkr. No. 1/Panel A.)

2.7 PANELBOARDS

- A. Provide nameplate on the front of the panel room which identifies the panel. (Example: Panel A.) Provide a nameplate concealed behind the door which identifies the panel, and the source panel. (Example: Panel A, Fed from Distribution Panel 1-Bkr. No. 2)

2.8 TRANSFORMER

- A. Provide nameplate identifying the transformer, the source panel and the panel served. (Example: Transformer T1/Fed from Distribution Panel 1, Bkr. No. 1/Serves Panel A)

2.9 DISCONNECT SWITCHES AND MOTOR STARTERS

- A. Provide nameplate which identifies the source panel, load served and the fuse size where applicable. (Example: School Tank Farm, Dispensing Tank, Pump Motor TP-01, 2 HP, RK1 fuses.)

2.10 JUNCTION AND PULL BOX IDENTIFICATION

- A. Mark the cover of all junction boxes and pull boxes to identify the system, circuits, or feeders contained within the box. Use red color for fire alarm. Circuits shall be identified by panelboards and specific circuit numbers contained within the junction box.

2.11 ARC FLASH HAZARD LABELS

- A. Provide label on all new distribution equipment which designates the appropriate PPE (Personal Protective Equipment) required for the hazard present. Labels to comply with the NEC and NFPA 70E. Submit sample of label to Engineer for review.

2.12 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
- B. Minimum Width: 3/16 inch.

- C. Tensile Strength: 50 lb, minimum.
- D. Temperature Range: Minus -40 to plus +185 degrees Fahrenheit.
- E. Color: Black, except where used for color-coding.
- F. Fasteners for Labels and Signs: Stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Power-Circuit Conductor Identification: For conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- B. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.
- C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
- E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- F. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- G. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
- J. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
- K. Power transfer switches.
- L. Controls with external control power connections.
- M. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

3.2 Labeling Instructions:

- A. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
- B. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

- C. Equipment to Be Labeled:
- a. Access doors and panels for concealed electrical items.
 - b. Electrical switchgear and switchboards.
 - c. Transformers.
 - d. Emergency system boxes and enclosures.
 - e. Motor-control centers.
 - f. Disconnect switches.
 - g. Enclosed circuit breakers.
 - h. Motor starters.
 - i. Push-button stations.
 - j. Power transfer equipment.
 - k. Contactors.
 - l. Remote-controlled switches, dimmer modules, and control
 - m. Devices.
 - n. Battery inverter units.
 - o. Battery racks.
 - p. Power-generating units.
 - q. Voice and data cable terminal equipment.
 - r. Master clock and program equipment.
 - s. Intercommunication and call system master and staff stations.
 - t. Television/audio components, racks, and controls.
 - u. Fire-alarm control panel and annunciators.
 - v. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
 - w. Monitoring and control equipment.
 - x. Uninterruptible power supply equipment.
 - y. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.3 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600V and Less: Use the colors listed below for ungrounded conductors.
- H. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
- I. Colors for 208/120-Volt Circuits:
 - Phase A: Black.
 - Phase B: Red.
 - Phase C: Blue.
 - Neutral: White.
 - Ground: Green.
 - Travelers: Yellow.
- J. Colors for 480/277-V Circuits:
 - Phase A: Brown.
 - Phase B: Orange.
 - Phase C: Yellow.
 - Neutral: Gray.
 - Ground: Green.
 - Travelers: Lavender.
- K. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- L. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

END OF SECTION

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL AND CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The requirements of this section apply to all sections of Divisions 26
- B. This project will have selected building systems commissioned.
- C. Related Sections:
 - 1. Division 01 and 26 Specifications

1.2 REFERENCES

- A. National Electrical Testing Agency.

1.3 COMMISSIONED SYSTEMS

- A. Commissioning of a system or systems specified in Divisions 26 is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's Operation and Maintenance personnel in accordance with the requirements of Division 26, is required.
- B. The Facility electrical systems commissioning will include all of the control panels provided or modified under this project.
- C. Electrical and Controls Systems commissioning process includes the following tasks:
 - 1. Testing and startup of Electrical and Control equipment and systems.
 - 2. Equipment and system verification checks.
 - 3. Assistance in functional performance testing to verify testing and equipment and system performance.
 - 4. Provide qualified personnel to assist in commissioning tests.
 - 5. Complete and endorse functional performance test checklists provided by Engineer to assure equipment and systems are fully operational and ready for functional performance testing.
 - 6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
 - 7. Provide operation and maintenance information and record drawings to Engineer for review verification and organization, prior to distribution.
 - 8. Provide assistance to Engineer to develop, edit, and document system operation descriptions.

9. Provide training for systems specified in this Section with coordination by Engineer.
- D. Equipment and Systems to Be Commissioned:
 1. New Electrical and Control systems that were installed under this Contract.
 2. Existing Electrical and Control systems that were modified, adjusted, upgraded, or affected by the work performed under this Contract.
- E. The following is a partial list of equipment that may be included in this Commissioning:
 1. Corporation Fuel System Controls
 2. City Fuel System Controls
 3. AEA Plant Fuel Supply Controls and Inventory Monitor
 4. All instrumentation related to new control and alarm panels.

1.4 COMMISSIONING SUBMITTALS

- A. Draft Forms: Submit draft of system verification form and functional performance test checklist.
- B. Test Reports: Indicate data on system verification form for each piece of equipment and system as specified.
- C. Field Reports: Indicate deficiencies preventing completion of equipment or system verification checks equipment or system to achieve specified performance.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 77 19 - Closeout Requirements
- B. Project Record Documents: Record revisions to equipment and system documentation necessitated by commissioning.
- C. Operation and Maintenance Data: Submit revisions to operation and maintenance manuals when necessary revisions are discovered during commissioning.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NETA requirements.
- B. Maintain one copy of each document on site.

1.7 COMMISSIONING RESPONSIBILITIES

- A. Equipment or System Installer Commissioning Responsibilities:

1. Attend commissioning meetings.
2. Ensure controls installer performs assigned commissioning responsibilities as specified below.
3. Ensure calibration agency performs assigned commissioning responsibilities as specified.
4. Provide instructions and demonstrations for Owner's personnel.
5. Ensure subcontractors perform assigned commissioning responsibilities.
6. Ensure participation of equipment manufacturers in appropriate startup, testing, and training activities when required by individual equipment specifications.
7. Develop startup and initial checkout plan using manufacturer's startup procedures and functional performance checklists for equipment and systems to be commissioned.
8. During verification check and startup process, execute process related portions of checklists for equipment and systems to be commissioned.
9. Perform and document completed startup and system operational checkout procedures, providing copy to Engineer.
10. Provide manufacturer's representatives to execute starting of equipment. Ensure representatives are available and present during agreed upon schedules and are in attendance for duration to complete tests, adjustments and problem-solving.
11. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
12. Provide personnel to assist Engineer during equipment or system verification checks and functional performance tests.
13. Prior to functional performance tests, review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during tests.
14. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for verification checks included in commissioning plan. When deficient or incomplete work is discovered, ensure corrective action is taken and re-check until equipment or system is ready for startup.
15. Provide factory supervised startup services for equipment and systems specified in Division 26. Coordinate work with manufacturer and Engineer.
16. Perform verification checks and startup on equipment and systems as specified.
17. Assist Engineer in performing functional performance tests on equipment and systems as specified.
18. Perform operation and maintenance training sessions scheduled by Engineer.
19. Conduct process system orientation and inspection.

B. Controls Installer Commissioning Responsibilities:

1. Attend commissioning meetings.
2. Review design for ability of systems to be controlled including the following:
 - a. Confirm proper hardware requirements exists to perform functional performance testing.
 - b. Confirm proper safeties and interlocks are included in design.
 - c. Confirm proper sizing of system control valves and actuators and control valve operation will result capacity control identified in Contract Documents.

- d. Confirm proper sizing of system control dampers and actuators and damper operation will result in proper damper positioning.
 - e. Confirm sensors selected are within device ranges.
 - f. Review sequences of operation and obtain clarification from Architect/Engineer.
 - g. Provide written sequences of operation for packaged controlled equipment. Equipment manufacturers' stock sequences may be included, when accompanied by additional narrative to reflect Project conditions.
3. Inspect, check, and confirm proper operation and performance of control hardware and software provided in other Electrical and Controls sections.
 4. Submit proposed procedures for performing automatic control system point-to-point checks to Engineer and Architect/Engineer.
 5. Inspect check and confirm correct installation and operation of automatic control system input and output device operation through point-to-point checks.
 6. Perform training sessions to instruct Owner's personnel in hardware operation, software operation (if applicable) , programming, and application in accordance with commissioning plan and requirements of Divisions 26..
 7. Demonstrate system performance and operation to Engineer during functional performance tests including each mode of operation.
 8. Provide control system technician to assist during Engineer verification check and functional performance testing.
 9. Provide control system technician to assist testing, adjusting, and balancing agency during performance of testing, adjusting, and balancing work.
 10. Assist in performing operation and maintenance training sessions scheduled by Engineer.
- C. Testing, Adjusting, and Calibration Agency Commissioning Responsibilities:
1. Attend commissioning meetings.
 2. Participate in verification of testing, adjusting, and calibration report for verification or diagnostic purposes.
 3. Assist in performing operation and maintenance training sessions scheduled by Engineer.

1.8 COMMISSIONING MEETINGS

- A. Attend initial commissioning meeting and progress commissioning meetings as required by Engineer.

1.9 COORDINATION

- A. Section 01 31 19 – Project Meetings.
- B. Notify Engineer minimum of four weeks in advance of the following:
 1. Scheduled equipment and system startups.
 2. Scheduled automatic temperature control system checkout.

3. Scheduled start of testing, adjusting, and calibration work.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 CONSTRUCTION INSPECTIONS

- A. Commissioning of Electrical systems will require inspection of individual elements of the electrical systems construction throughout the construction period. The Contractor shall coordinate with the Engineer to schedule electrical systems inspections as required to support the Commissioning Process.

3.2 PRE-FUNCTIONAL CHECKLISTS

- A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing.
- B. The Engineer will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the Owner and to the Engineer for review. The Engineer may spot check a sample of completed checklists.
- C. If the Engineer determines that the information provided on the checklist is not accurate, the Engineer will return the marked-up checklist to the Contractor for correction and resubmission. If the Engineer determines that a significant number of completed checklists for similar equipment are not accurate, the Engineer will select a broader sample of checklists for review.
- D. If the Engineer determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission.

3.3 CONTRACTORS TESTS

- A. Contractor tests as required by other sections of Division 26 shall be scheduled and documented in accordance with Division 01 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Engineer will witness selected Contractor tests at the sole discretion of the Engineer. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Engineer will prepare detailed Systems Functional Performance Test procedures for review and approval by the Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Engineer will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed.

3.5 TRAINING OF OWNER'S PERSONNEL

- A. Training of the operation and maintenance personnel is required. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes. The instruction shall be scheduled in coordination with the Engineer after submission and approval of formal training plans.

END OF SECTION

SECTION 26 09 20

FUEL OIL AND GASOLINE CONTROL PANEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pump control system including motor control contactors and overloads where applicable, pump alternation, switches, push buttons, indicating lights, display and control relays.
- B. Related Sections:
 - 1. Section 26 00 00 – Electrical Methods and Materials.
 - 2. Section 26 05 19 - Low-Voltage Electrical Power.
 - 3. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. Underwriters' Laboratories
 - 1. UL 508 - Industrial Control Equipment.

1.3 CONTROL PANEL SCOPE

- A. Dispenser Control Panel CP – Provides all of the power, controls and alarms for the operation of the dual product dispenser and fleet (hose reel) distribution systems. It interfaces with the point of sale system remote consoles and local dispensing equipment.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Control Panel Engineering Submittal: The CONTRACTOR shall submit a control panel engineering submittal (CPES) for each control panel and enclosure provided under Division 40. The CPES shall completely define and document the construction, finish, fuses, circuit breakers, internally-mounted hardware, communications hardware, and control system components. All panel drawings shall, as a minimum, be "B" size with all data sheets and manufacturer specification sheets being "A" size.

The submittal shall be in conformance with ISA-S20 – Standard Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, shall be submitted as a singular complete bound volume or multi volume package within 60 calendar days after Notice to Proceed, and shall have the following contents:

1. A complete index shall appear in the front of each bound volume. All drawings and data sheets associated with a panel shall be grouped together with the panels being indexed by systems or process areas. All panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.
 2. Scale construction drawings which define and quantify the type and gauge of steel to be used for panel fabrication, the ASTM grade to be used for structural shapes and straps, panel door locks and hinge mechanisms, type of bolts and bolt locations for section joining and anchoring, details and proposed locations for "UNISTRUT" members, stiffener materials and locations, electrical terminal box and outlet locations, electrical access locations, print pocket locations, writing board locations, and lifting lug material and locations.
 3. Cutout locations with nameplate identifications shall be shown.
 4. The Contract Drawing wiring diagrams shall be edited to identify electrical devices, terminals, and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.
 5. A bill of material which enumerates all devices associated with the control panel.
- C. Product Data: Submit catalog information and descriptive literature for components.
- D. Test Reports: Submit certified factory test report indicating control panel successfully performs functions specified.
- E. Manufacturer's Installation Instructions: Submit instructions on installation and field wiring connections.
- F. Manufacturer's Field Reports: Submit certification after installation that control panel has been installed in accordance with manufacturer's instructions and has been successfully field tested.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 77 19 - Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of control panel and final wiring diagrams and connections.
- C. Operation and Maintenance Data: Submit operation and maintenance instructions for components and devices.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with UL 508A and 698A as required.

- B. Provide components compatible with functions required to form complete working system.
- C. Provide UL 508A and or 698A label on complete assembly.
- D. Perform Work in accordance with NEC.
- E. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer and Fabricator: Company specializing in manufacturing and assembling products specified in this section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 13 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspect for damage.
- C. Store in areas protected from weather, moisture, or possible damage; do not store directly on ground; handle to prevent damage to wiring and components.

1.9 COORDINATION

- A. Coordinate work and component requirements with controlled pumps.

1.10 EXTRA MATERIALS

- A. Section 01 77 19 - Closeout Requirements.
- B. Furnish the following spare parts for each panel provided under this contract:
 - 1. 6 pilot light LEDs for each tint.
 - 2. 1 24 volt DC power supply for each size utilized.
 - 3. 24 fuses for each type and size utilized.
 - 4. 1 general purpose relay for each type utilized.

PART 2 - PRODUCTS

2.1 CONTROL PANEL ASSEMBLIES

- A. Acceptable manufacturers include but are not limited to:
 - 1. TecPRO, Anchorage, Alaska

2. Dowland-Bach, Anchorage, Alaska
 3. Systems Interface, Bothell Washington
- B. The Point of Sale system is based on a performances specification and the Contractor is required to provide any modification to the controls design to permit proper operation of the Fuel dispensing system.

2.2 GENERAL

- A. Panel construction shall conform to NFPA 70 (NEC) Article 409 and NFPA 79.
- B. The control panel controls shall be 120 or 24 VDC. Control conductors shall be provided in accordance with the indicated requirements.
- C. The control panel shall be the source of power for any 120 VAC or 24VAC or DC instruments or solenoid valves and their controllers interconnected with the control panel. All equipment associated with the control panel shall be ready for service after connection of conductors to equipment, controls, and control panel.
- D. Unless indicated otherwise, control panels shall be housed in NEMA-rated enclosures as shown on the Drawings. Control panels shall be either wall-mounted, pedestal-mounted or equipment skid-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.
1. All interior control or relay panels mounted above ground level shall be NEMA 12.
- E. Each source of 'external' voltage shall be isolated by providing disconnecting fused terminal blocks or DIN rail mounted relays. Each control panel shall be provided with identified terminal strips for the connection of all external conductors. The CONTRACTOR shall provide sufficient terminal blocks as shown on the Drawings.
- F. Discrete outputs from the control panels shall be provided by electrically isolated contacts rated for 2 amps at 24 VDC or 5 amps at 120 VAC.
- G. All control panel mounted devices shall be provided as shown on the Drawings or called for in the specifications.
- H. Painting: Steel control panels shall be thoroughly cleaned and sand blasted per Steel Structures Painting Council Specification SSPC SP 6 (Commercial Blast) after which surfaces shall receive a prime coat of Amercoat 185, or equal, 3 mils DFT, for a total thickness of the prime plus finish system of 6 mils. The finished color of the outside surfaces shall be ANSI 61 gray paint. Interior of the control panel, back-panel, and side-panels shall have a white finish coat.

2.3 COMPONENTS

- A. General: Additional components may be specified on the plans in individual component schedules.

B. Control Panel Enclosure:

1. Furnish NEMA 250 Type 12 enclosure fabricated of 10 gage steel with continuously welded seams.
 - a. Dual Door, wall mounted.
 - b. Enclosure door gasketed with neoprene.
 - c. Heavy-duty three-point latching mechanism.
 - d. Power: 120/240 volt, 3 phase, 4 wire open delta service.
2. Identify control panel components with engraved nameplate mounted on inside of panel.
3. Mount components, not mounted on front of panel, on removable back panel secured to enclosure with collar studs.
4. Install wiring in neat, workmanlike manner and group, bundle, support and route horizontally and vertically for neat appearance.
5. Terminate wires leaving panel at terminal strips inside enclosure.
6. Identify terminals and wires in accordance with panel wiring diagrams.
7. Furnish copper grounding plate inside control panel for terminating ground wires.

C. Circuit Breakers:

1. Furnish quick-make, quick-break thermal-magnetic molded case type, individually DIN rail mounted and identified.
2. Furnish individual circuit breakers for each of the following:
 - a. Main Circuit Breaker
 - b. Lighting
 - c. Enclosure environment
 - d. Control and instrumentation Circuit(s)
 - e. Each pump served from the panel unless otherwise noted.
 - f. Dispenser and POS Electronics (on filtered isolated circuit).

D. Legend Plates for Pilot Devices:

1. Furnish 2x2-1/2 inch plastic legend plate with rounded corners for each selector switch, push button and pilot light.
2. Color: Gray with white lettering.

E. Mounting of Instruments

1. The panel vendor shall provide cut outs, and shall mount all instrument items indicated to be panel-mounted, including any instruments indicated to be furnished by other vendors but installed in the panel.
2. The panel vendor shall also mount behind the panels other instrument accessory items as required for functionality or as indicated.
3. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal.
4. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.

F. Pilot Devices

1. Pilot devices shall be Allen Bradly Bulletin 800, 30mm, NEMA 4X rated or approved equal.

G. Electrical Requirements

1. The CONTRACTOR shall provide conduit, wireways, switches, wire, and electrical fittings for all 24 VDC and 120 VAC circuits to instruments and other electrical devices as required for a complete and operable installation.
2. Conduit, wireways, junction boxes and fittings shall include those required between sensors and transmitters and between the junction boxes and instruments.
3. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. Wiring shall be identified with stamped tubular wire end markers. Terminals shall be DIN rail mounted, rated at 400 VAC, manufactured by Entelec, or equal.
4. Each panel shall be provided with a switched 60 watt incandescent T-10 style light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch. The fixture shall be Hoffman model A-LTDB1, or equal.
5. Each panel shall be provided with a switched light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch.
6. Wiring Methods: Wiring methods and materials for all panels shall be in accordance with the N.E.C. requirements for General Purpose (no open wiring) unless otherwise indicated.
7. Signal and Control Circuit Wiring
 - a. Wire type and sizes: Conductor shall be flexible stranded copper wire, UL. Wires for instrument signal circuits and alarm input circuits shall be No. 16 AWG Type MTW rated for 300 volts. The analog cables between the PLC I/O card and terminal strips shall be (8) conductor No. 18 AWG cable rated 300 volts for loop powered devices and 8-pair shielded No. 18 AWG cable rated 300 volts for 4-wire loops.
 - b. Wire Insulation Colors:
 - 1) 120 VAC Power - Black 14 AWG minimum
 - 2) 120 VAC Neutral - White 14 AWG minimum
 - 3) 120 VAC Ground - Green 14 AWG minimum
 - 4) 120 VAC Control - Red 14 AWG minimum
 - 5) 120 VAC Foreign Power - Yellow 16 AWG minimum
 - 6) 120 VAC Foreign Neutral - Yellow 16 AWG minimum
 - 7) DC Positive - Blue 16 AWG minimum
 - 8) DC Negative - White/Blue 16 AWG minimumAll 120 VAC power wiring protected by the main circuit breaker and incoming power service shall be No. 12 AWG.
 - c. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from heat shrink plastic. Wires shall be marked as shown on the Drawings. Numbers shall read from left to right.
 - d. Flexible conduit is only to be used where specified.
 - e. Conduit fittings shall be Crouse Hinds cast fittings, or equal.

- f. For equipment grounding, panels shall be provided with a 1/4 inch by 1 inch copper ground bus complete with solder-less connector for one No. 4 AWG bare stranded copper cable. The copper cable shall be provided by the CONTRACTOR and be connected to the electrical equipment ground of the 120-volt panel supplying power.
8. Power Supply Wiring
 - a. Unless otherwise indicated, all instruments, alarm systems, and motor controls shall operate on 24 VDC circuits.
 - b. The panel fabricator shall provide terminal box connections for the main power supply entry as shown on the Drawings.
 - c. When instruments do not come equipped with integral fuses, provide fuses as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel in a fuse holder, and each fuse shall be identified by a service name tag. Fuses shall be as manufactured by Bussmann Manufacturing Division, Type KAW TRON, or equal. Circuit breakers shall be provided as shown on the Drawings.
- H. Relays:
 1. DIN rail mounted interposing relays isolating the Honeywell Recorder outputs shall have contacts rated at 8 amps, 230 volts, at 20,000 operations. The coils shall be 24 VDC at 0.03 amps. Relays shall be Entrelec model RB121A, or equal, for single pole, and RB122 for 5-amp double pole.
 2. DIN rail mounted general purpose relays shall have square base with contacts rated at 10 amps, 230 volts, at 20,000 operations. The coils shall be 120 VAC at 0.03 amps. Relays shall be 2, 3 or 4-pole as required with power on LED and manual override, Allen Bradley or equal.
 3. Power Contactors and Motor starters:
 - a. Rated for voltage and horsepower shown on plans
 - b. When overload protection is shown or required by code, provide adjustable Electronic overload modules.
- I. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. Wiring shall be identified with stamped tubular wire end markers.
- J. Digital Control Terminals: Fused Terminals for the discrete input points shall be 2-wire terminal with a fused circuit and a feed through circuit. Provide a one-tenth of an ampere rapid blow 250-volt fuse for all discrete input circuits. The discrete input terminal shall be Weidmuller model KDKS 1 PE part 953245.
- K. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. Wiring shall be identified with stamped tubular wire end markers. 120V terminals shall be DIN rail mounted, rated at 400 VAC, manufactured by Entrelec, or equal.
- L. Spare Fuses: For each panel, provide the following spare fuses:
 1. A minimum of two spare fuses of each size
 2. One spare fuse for every 5 fused circuits

Provide the fuses in a spare fuse box mounted on the interior wall of the panel. Fuse box shall be Plano Tackle Systems 1061 Accessory Box, Plano, IL, www.planomolding.com, or equal.

- M. Power Supply 24 VDC: Each panel's instrumentation and interposing relays shall be supplied from a 24 VDC power supply. Minimum 2.5A, SOLA SDN2.5-24-100P or equal
- N. 120 VAC Surge Arrestor: A 120 VAC three-stage surge protector shall be provided on the control voltage supply for each panel. The surge protector shall include a first stage inline inductor, a second stage MOV to ground with a thermal fuse, and a third stage array of MOVs to provide a small amount of capacitance. The unit shall be DIN rail-mounted. The MOV shall include green LED to indicate the status of the second stage MOV. Provide two (2) spare units for each panel. The unit shall be rated for 120 VAC and shall be either Advance Surge Suppressor model TSP-WG6-120VAC-10A-01, Control Concepts 'Isatrol Elite' model IE-110, or equal.
- O. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

2.4 MARKING

- A. Control panels shall be marked with the following information that is plainly visible after installation:
 - 1. Manufacturer's name
 - 2. Supply voltage
 - 3. Short-circuit rating of the main breaker
 - 4. Name of the project and site
 - 5. Enclosure rating
 - 6. Minimum Size of Control Wiring: Number 16.
 - 7. Tag control wiring at both ends in control panel with legible permanent coded wire marking sleeve. Mark with white PVC tubing sleeves with machine printed black marking. Mark in accordance with wire numbers shown on approved shop control wiring diagrams and terminal strip numbers.

2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Perform a factory test of completed control panel by demonstrating operation of control functions. Provide certified test results.
- B. Factory assemble and test each control and alarm function.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify correct power supply is available.
- B. Verify pumps are installed.

3.1 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

- A. Wiring Installation: All wires shall be run in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing out panel to components on a part of the fixed structure, and (4) wiring to panel mounted components. Wiring run from components on a swing out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.
- B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.
- C. Enclosures Wiring: All wiring shall be run in liquidtight flexible conduit (LFMC), unless otherwise noted on the Drawings. All enclosure wiring and raceways shall be installed by the panel builder in the shop.
- D. Wiring to rear terminals on panel mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.
- E. Shop Drawings shall show conformance to the above wiring installation requirements.
- F. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number as shown on the Contract Drawings. These numbers shall be marked on all conductors at every terminal.

3.2 CALIBRATION, TESTING, AND INSTRUCTION

- A. General: Calibration, testing, and instruction shall be performed by the Contractor in the presence of the Owners representative..
- B. Inspection and Approval
 - 1. Panel fabricator shall conduct the following tests prior to arrival of the ENGINEER or before shipment, if the ENGINEER chooses not to witness factory testing.
 - a. All status, control, analog and alarm circuits rung out to determine their operability.

- b. All electrical power circuits checked for continuity and where applicable, operability.
 - c. Any other test required to place the panel in an operating condition.
2. It shall be the responsibility of the CONTRACTOR to furnish all necessary testing devices and sufficient manpower to perform the tests required by the ENGINEER.
3. Field Testing: Each control panel shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

3.3 INSTALLATION

- A. Install control panel at location indicated on Drawings.
- B. Install control panel in accordance with manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

- A. Section 01 77 19 - Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Start-up control system by energizing system equipment and testing operation of hardware and process control logic under supervision of manufacturer's representative and in presence of Architect/Engineer.
- C. Equipment Acceptance:
 1. Adjust, repair, modify or replace system components that fail to perform as specified and rerun tests. Make final adjustments to equipment under direction of manufacturer's representative.
 2. Document adjustments, repairs and replacements in manufacturer's field services certification.

3.5 MANUFACTURER'S FIELD SERVICES

- A. Section 01 45 00 - Quality Control.
- B. Furnish services of manufacturer's representative experienced in installation of products furnished under this specification for not less than 5 man days on-site for installation inspection and field testing, and instructing Owner's personnel in maintenance of equipment.
- C. Certify that equipment has been properly installed and is ready for start-up and testing.

3.6 DEMONSTRATION

- A. Section 01 77 19 - Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate equipment startup, shutdown, routine maintenance, alarm condition responses, and emergency repair procedures to Owner's personnel.

END OF SECTION

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. RFI: Radio-frequency interference.
- C. SPDT: Single pole, double throw.

1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Bus configuration, current, and voltage ratings.
 - b. Short-circuit current rating of panelboards and overcurrent protective devices.
 - c. UL listing for series rating of installed devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Panelboard Schedules: For installation in panelboards.
- D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories: Square D or approved equal.
2. Transient Voltage Suppression Panelboards: Square D or approved equal.

2.2 MANUFACTURED UNITS

A. Enclosures:

1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
2. Hinged Front Cover: Door within door.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

D. Service Equipment Label: UL labeled for use as service equipment

for panelboards with main service disconnect switches.

- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 TRANSIENT VOLTAGE SUPPRESSION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Devices: Thermal-magnetic circuit breaker.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.
- D. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
- E. Transient Voltage Suppression Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.
 - 1. Minimum Single-Impulse Current Ratings:
 - a. Line to Neutral: 100,000 A.
 - b. Line to Ground: 100,000 A.

- c. Neutral to Ground: 50,000 A.
2. Protection modes shall be as follows:
 - a. Line to neutral.
 - b. Line to ground.
 - c. Neutral to ground.
3. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
4. Maximum Category C Combination Wave Clamping Voltage: 600 V, line to neutral and line to ground on 120/208 V systems.
5. Maximum UL 1449 Clamping Levels: 400 V, line to neutral and line to ground on 120/208 V, 800 V, line to neutral and line to ground on 277/480 V systems.
6. Withstand Capabilities: 3000 Category C surges with less than 5 percent change in clamping voltage.

2.7 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2.8 SPACE FOR FUTURE CIRCUIT BREAKERS OR FUSED SWITCHES

- A. Provide as indicated on the drawings. Spaces shall be completely equipped for the future addition of a circuit breaker or fused switch, including all mounting hardware and buss connections. Unless otherwise noted, spaces shall be sized to accommodate the following future circuit breaker or fused switch:

<u>Panel Rating</u>	<u>Minimum Space Ampacity</u>
100 Amps	70 Amps
225 Amps	125 Amps
400 Amps	225 Amps

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- B. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- C. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.
- D. Install filler plates in unused spaces.
- E. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior luminaires with lamps and ballasts.
 - 2. Luminaire-mounted photoelectric relays.
 - 3. Wall / ceiling mounted luminaries

1.3 DEFINITIONS

- A. CRI: Color-rendering index.
- B. LED: Light emitting diode
- C. Luminaire: Complete lighting fixture, including ballast housing if provided.
- D. Pole: Wood light pole support structure.

1.4 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 - 2. Details of attaching luminaires and accessories.
 - 3. Details of installation and construction.
 - 4. Luminaire materials.
 - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - a. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for

- remaining luminaires shall be certified by manufacturer.
- b. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 6. Photoelectric relays.
- 7. Drive and/or Ballasts, including energy-efficiency data.
- 8. Lamps, including life, output, and energy-efficiency data.
- 9. Materials, dimensions, and finishes of poles.
- 10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
- B. Shop Drawings:
 - 1. Wiring Diagrams: Power and control wiring.
- C. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Metal Parts: Free of burrs and sharp corners and edges.

- C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and, where applicable, designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- F. Exposed Hardware Material: Stainless steel.
- G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- I. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- J. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 FC and off at 4.5 to 10 FC with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
 - 1. Relay with locking-type receptacle shall comply with NEMA C136.10.
 - 2. Adjustable window slide for adjusting on-off set points.

2.3 BALLASTS FOR HID LAMPS

- A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation

without reduction of average lamp life. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 50 deg F.
3. Normal Ambient Operating Temperature: 104 deg F.

2.4 HID FIXTURES

- A. As shown on fixture schedule.

2.5 LED FIXTURES

- A. As shown on fixture schedule.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Provide luminaires with lamps.
- B. Fasten luminaire to structural supports as required by the type pole or surface.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This item consists of furnishing all labor, equipment, supplies, and material in performance of all operations required for site clearing, grubbing and clean-up operations.

1.2 RELATED REQUIREMENTS

- A. Section 31 23 00 Excavation and Fill.
- B. Section 31 23 19 Dewatering and Control of Surface Water.

1.3 DEFINITIONS

- A. Clearing: Includes cutting all brush, trees and stumps, to within 6 inches of natural ground, chipping and disposing of the cuttings. Clearing also includes the removal of all snow and ice in the project area.
- B. Grubbing: Includes the removal and disposal of all stumps, roots, organics, buried logs, brush and other objectionable material or debris not otherwise indicated to remain.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall perform all clearing and grubbing operations where designated on the Contract Drawings and as specified herein or as directed by the owner.
 - 1. Locate, identify and protect utilities from damage.
 - 2. Verify with the Owner any vegetation to remain.
- B. The project site may contain miscellaneous debris including connexes, inoperable construction equipment, construction material, and other debris. CONTRACTOR must coordinate with the appropriate owner or governing authority as necessary to relocate all materials, waste, and equipment that interfere with proposed improvements to approved offsite location.

3.2 PROTECTION

- A. Provide protection as necessary to prevent damage to existing improvements and utilities indicated to remain.
 - 1. Protect improvements on adjoining properties and on project site.
 - 2. Protect trees, plant growth and features designated to remain. Protect survey benchmarks, property corners, survey monuments and existing work from damage or displacement.
- B. All property corners, benchmarks or other permanent survey marker disturbed during construction shall be removed and recorded. The CONTRACTOR shall be responsible for the resurvey and resetting of any disturbed property corners, benchmarks or other permanent survey markers by a professional land surveyor, licensed by the State of Alaska.

3.3 USE AND DISPOSAL OF GRUBBED MATERIAL

- A. Cleared and grubbed material shall be disposed of at a CONTRACTOR furnished disposal area.
- B. Except as otherwise stated, the CONTRACTOR shall make his/her own arrangements and assume all cost in connection with disposal sites. Disposal sites shall be located and maintained in such a manner as to prevent a public nuisance.
- C. If the disposal site is located on private land, the CONTRACTOR shall obtain written permission from the property owner or owners for such disposal sites and shall furnish the Project Manager with a copy of this permission. The written permission shall specifically provide that the property owner will not hold AUTHORITY, its employees, agents, or engineers liable for use or damage to this property. The CONTRACTOR shall be held liable for any trespass and property damage incurred outside of the disposal site.

END OF SECTION

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This item consists of furnishing all labor, equipment, supplies, and material in performance of all earthwork operations including construction of access road(s), tank farm & dispensing pad(s), permanent laydown area, and bulk transfer area.
- B. Important Notes:
 - 1. CONTRACTOR shall make his own determination of the adequacy of the site to support equipment and other construction loads. Additional fill material and/or crane mats may be required to support loads during construction and CONTRACTOR shall provide additional fill and/or crane mats as required at no additional cost to the Owner.

1.2 RELATED REQUIREMENTS

- A. Division 01 Specifications.
- B. Section 02 32 00 Geotechnical Investigations.

1.3 QUALITY CONTROL ASSURANCE

- A. Testing Procedures and Methods:
 - 1. Moisture-Density test standard: ASTM D1557 or AASHTO T-180, Method D.
 - 2. In-place Density Determination: Nuclear Method ASTM D2922 or AASHTO T-238.
 - 3. Gradation Analysis: ATM T-7, ASTM C136 or AASHTO T-27.
 - 4. Other testing procedures and methods referenced in individual specification sections.
- B. Quality Control Monitoring:
 - 1. CONTRACTOR shall secure and pay for all required quality control monitoring. CONTRACTOR shall utilize Project Manager approved, certified, independent laboratory and field personnel for all required testing.
 - 2. Provide certified test results as required in Section 1.4, Submittals.

3. Fill material placed prior to Project Manager Approval of test results is at the sole risk of the CONTRACTOR. Material not meeting requirements shall be removed and replaced at CONTRACTOR's expense.
- C. Minimum testing requirements are indicated below.
1. Moisture Density and Gradation Analysis:
 - a. Classified Fill: Two (2) samples shall be taken at each Classified Fill material source to be used in the work. One (1) additional sample shall be taken when any change in material occurs which, in the opinion of the Engineer, may significantly affect the optimum moisture content or maximum laboratory dry density.
 - b. If laboratory tests indicate that the fill material does not meet the specification requirements, the CONTRACTOR shall provide additional certified tests for alternative fill material sources at no additional cost to the Owner.
 - c. If laboratory tests indicate that the fill material does not meet the specification requirements, the CONTRACTOR shall provide additional certified tests for alternative fill material sources at no additional cost to the AUTHORITY.
 2. In-Place Density:
 - a. One (1) test for every 200 cy of embankment fill placed (Minimum of one test per lift is required regardless of fill quantity).
 - b. The results of each density test shall be recorded on a test sheet. The following information shall be recorded.
 - 1) Horizontal and vertical location.
 - 2) Density and percent of referenced standard compaction.
 - 3) Material description and appropriate compaction control standard.
 - c. If test results indicate insufficient compaction, CONTRACTOR shall cease placement of fill and provide additional compaction effort and/or moisture conditioning until subsequent in-place density testing indicates proper compaction has been achieved.
 - d. All costs associated with additional in-place density testing as a result of failed tests shall be borne by the CONTRACTOR.

1.4 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions, Division 1, and this Section.
- B. Provide the following submittals:
 1. Name of proposed independent certified testing laboratory and field testing sub-consultant.
 2. Format of proposed laboratory and field test forms.

3. Laboratory results of gradation and moisture density tests for each fill type to be used on the project.
 4. If the CONTRACTOR changes the source and/or stockpile from which materials are obtained, Gradation Analysis and Moisture-Density test reports for these new sources shall be submitted to the Project Manager.
 5. Results of all in-place density field tests.
 6. Catalog and manufacturer's data sheets for proposed compaction equipment.
 7. Disposal plan for unusable excavation.
- C. Additional Testing:
1. All testing necessary for the CONTRACTOR to locate acceptable sources of classified or unclassified fill material for the project shall be provided by the CONTRACTOR at no additional cost to the Owner.
 2. During construction, the owner may elect to have further gradation and compaction testing completed on the materials being furnished by the CONTRACTOR. This testing shall be at the expense of the Owner. The CONTRACTOR shall provide material samples as may be necessary to complete this testing and these material samples shall be furnished from material available on the Project site or from the CONTRACTOR's source and/or supplier.

1.5 MATERIAL SOURCES

- A. Classified Fill: There are no known operating borrow sources for classified material in Tatitlek. A pit was temporarily opened during the last airport construction project, further development would require coordination with the land owner. Contractor shall be responsible for procuring and transporting all classified fill required for this project. Contractor responsibilities shall include, but not be limited to, procurement of fill, transportation, testing, offloading, storage and placement.

Imported material has historically been available from Valdez or Whittier.

- B. It is the responsibility of the CONTRACTOR to select a material source for the project and supply material that meets the requirements for Classified Fill materials.
- C. The CONTRACTOR shall coordinate as necessary with the borrow pit surface and subsurface property owners, shall acquire all necessary permits and/or material sales agreements, and shall pay all required fees, royalties, and other costs associated with pit access and material extraction.
- D. The CONTRACTOR shall be responsible for all costs associated with locating, procuring, transporting, testing, storing, placing and compacting fill material

for the work. The Owner is not responsible for fill lost during transportation.

PART 2 - PRODUCTS

2.1 UNCLASSIFIED EXCAVATION

- A. Excavation from the project area shall be considered unclassified. Complete all excavation regardless of the type, nature or condition of the materials encountered as shown on the drawings and/or at the Project Manager's direction.
- B. Excavation conforming to the specifications for Classified Fill Materials may be reused. Unclassified excavation intended for reuse shall be stockpiled and tested prior to placement in the work.
- C. Dispose of unusable excavation at a location provided by CONTRACTOR and approved by Owner.

2.2 CLASSIFIED FILL MATERIALS

- A. Fill Material shall meet the requirements for Classified Fill material listed below.

- B. Classified Fill:

- 1. Classified fill material shall consist of mineral soil, free from dirt, muck, frozen chunks, clay balls, roots, organic material, debris, or deleterious material. It shall have a liquid limit no greater than 25 and a plasticity index no greater than 6 as determined by AASHTO T-89 and T-90.

- 2. Type I classified fill material:

Type I classified fill material shall conform to the following gradation as determined by AASHTO T-27:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
4 inch	100
2 inch	85-100
No. 4	20-60
No. 200	4-12

- 3. Type II classified fill material shall be crushed gravel consisting of sound, tough, durable rock fragments of uniform quality and shall meet the following requirements:

Degradation Value (ATM T-13): 45 Min
Percent Fracture (ATM T-4): 50 Min (Single Face)

Type II classified fill material shall conform to the following gradation as determined by AASHTO T-27:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
1 inch	100
No. 4	35-65
No. 10	25-45
No. 200	4-10

4. Rip-Rap/Armor Rock classified fill material shall be crushed/blasted consisting of sound, tough, durable rock of uniform quality and shall meet the following requirements:
- At least 85% larger than 3" but less than 12"
 - At least 50% larger than 6"
 - Materials smaller than 3" consisting predominantly of rock spalls and shall be free of soil

C. Pipe Bedding Material: Use Type II classified material.

PART 3 - EXECUTION

3.1 GENERAL

- A. Safety – The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain excavation sideslopes and prevent sloughing to ensure that persons working in or near the excavation are protected.
- B. Notify Project Manager of any discrepancies between Contractual requirements and site conditions prior to start of Work.
- C. Maintain subgrade, backfill and embankment areas or lifts open until testing is complete and testing requirements are met, or approval of testing is secured from the Project Manager.
- D. Any work covered up prior to test completion and achieving testing requirements or Project Manager's approval shall be excavated and reconstructed at CONTRACTOR's expense.
- E. Work in inclement weather is at CONTRACTORs risk. Any materials which become unstable as the result of improper moisture content, improper selection of techniques, equipment, or operations during inclement wet weather shall be replaced at CONTRACTOR's expense.

- F. Excavations and embankment shall be accomplished in such a manner that drainage is maintained at all times; any areas not so drained shall be kept free of standing water by pumping if necessary.
- G. The CONTRACTOR shall provide for the proper maintenance of traffic flow and accessibility as may be necessary, and shall also make adequate provisions for the safety of property and persons.
- H. No separate payment for any excavation shall be made. All excavation shall be incidental to the Bid Item being performed.

3.2 EXCAVATION

- A. Excavate to lines and grades shown on the Contract Drawings. Remove and dispose of all topsoil, dirt, muck, frozen chunks, clay balls, roots, organic material, debris, or deleterious material.
- B. At CONTRACTOR's option, unclassified excavation may be stockpiled and tested for conformance with classified fill specifications. See Part 1 of this specification for testing requirements.
- C. Disposal of Excess Excavation:
 - 1. Dispose of all excess excavated materials offsite. CONTRACTOR shall make arrangements for the disposal of the excavated material and bare all costs incidental to such disposal.
 - 2. Sideslopes of excavation waste piles shall be sloped to match the materials natural angle of repose, or flatter.
 - 3. Excavation waste areas shall be completely within the limits of the disposal area property.
- D. Dewatering:
 - 1. Excavate all materials in a dewatered condition unless approved otherwise by the Project Manager.
 - 2. Dewatering shall be performed in accordance with the requirements of Section 31 23 19, Dewatering and Control of Surface Water.
- E. Unauthorized Excavation:
 - 1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or neat-line dimensions without written direction by the Project Manager.
 - 2. Unauthorized excavation, as well as remedial work as directed, shall be at CONTRACTOR's expense.

3. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

3.3 SITE PREPARATION

- A. Clear and grub the construction area in accordance with Section 31 11 00 of the Specifications and the Contract Drawings. Remove all organic material, silt, and top soil and dispose at a location provided by the CONTRACTOR.
- B. Project area must be fully thawed (no seasonal frost) prior to placement of fill.
 1. Prior to placement of fill CONTRACTOR shall demonstrate that ground is frost free by excavating a minimum of three test pits evenly spaced over the project area.
 2. Minimum test pit depth shall be 8 feet.
 3. If frozen soils are encountered, the Project Manager shall be notified and the test pit shall be filled. At the discretion of the Project Manager additional time shall be allowed for the ground to thaw. Subsequent test pits shall be dug a minimum of 10 ft horizontal from previous pits.
- C. Fill all depressions or holes below the general area surface level, whether caused by test pits, removal of debris or unacceptable material, or otherwise. Fill with Classified material as shown on the drawings, and compact to specified density and to a level, uniform surface before the placement of subsequent layers.
- D. Sloped ground surfaces steeper than 1 vertical to 4 horizontal on which embankment is to be placed shall be plowed, benched, or broken up in such manner that the fill material will bond with the prepared surface.

3.4 EMBANKMENT CONSTRUCTION

- A. Embankment Fill Placement:
 1. The specified material shall be placed at the locations and to the lines and grades indicated on the Contract Drawings. The material shall be placed and spread uniformly in successive layers not exceeding eight (8) inches in loose thickness. The Project Manager may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted in accordance with Section 3.5 of this Specification.
 2. Blading, rolling, and tamping shall continue until the surface is smooth, free from waves and irregularities, and conforms to elevations shown on the Contract Drawings. If at any time the material is excessively

wet; it shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory. The surface shall then be compacted and finished as specified above.

3. Oversized material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Project Manager. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

3.5 COMPACTION

- A. Compact each embankment lift to 95% of maximum density at optimum moisture content as determined by ASTM D1557 or AASHTO T-180, Method D.
- B. Correct improperly compacted areas or lifts if soil density tests indicate inadequate compaction.
- C. Portions of any lift in which the materials become segregated to the extent that the required percent compaction cannot be attained, shall be removed by the CONTRACTOR and replaced with satisfactory materials, or blended with additional material until segregation is eliminated and specified percent compaction is attained.
- D. If, in the opinion of the Project Manager, based on testing service reports and inspection, subgrade and layers of embankment that have been placed are below specified density, the CONTRACTOR shall perform additional compaction and testing at elevations directed by the Project Manager until specified density is obtained, at no additional cost to the Owner.
- E. The CONTRACTOR shall be responsible for providing the proper size and type of compaction equipment and for selecting the proper method of operating said equipment to attain the required compaction density.

3.6 GRADING

- A. Existing ground contours shown on the Contract Drawings are based upon limited survey information and are approximate.
- B. Finished surfaces shall be not more than 0.10 foot above or below the finished grade elevations shown on the Contract Drawings; soft spots or settling areas shall be corrected at CONTRACTOR's expense. Feather finish grades to match adjacent existing roads and parking surfaces where required.

3.7 MAINTENANCE

- A. As necessary, CONTRACTOR shall water the site while grading is in progress to control dust.
- B. CONTRACTOR shall protect newly graded areas from traffic and erosion and

keep free of trash and debris.

- C. CONTRACTOR shall repair and re-establish grades in settled, eroded and rutted areas as directed by the Project Manager.
- D. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- E. All open excavations shall be adequately signed and barricaded to protect the public.

3.8 DENSITY TEST RECORD DOCUMENTATION

- A. The results of each density test shall be recorded on a test sheet. The following information shall be recorded.
 - 1. Horizontal and vertical location.
 - 2. Density and percent of referenced standard compaction.
 - 3. Material description and appropriate compaction control standard.

END OF SECTION

SECTION 31 23 19
DEWATERING AND CONTROL OF SURFACE WATER

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section describes the requirements for dewatering and the control of surface water during construction.

1.2 SYSTEM DESCRIPTION

- A. Dewatering and temporary diversion works shall be designed by and be the sole responsibility of the CONTRACTOR.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Selection of equipment and materials to perform the work is at the option of the CONTRACTOR.

PART 3 - EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall make his own provisions for diverting surface run off, alleviating ponding water, and dewatering excavation when ground water is encountered.
- B. CONTRACTOR shall be responsible for coordinating, acquiring, and paying for all permits required for dewatering operations.
- C. Remove ponded water and limit water flowing or infiltrating into the work area to the extent that the quality of work is not compromised.
- D. Surface water flows within the work area shall be diverted by constructing temporary ditches, berms, or other means to control and direct the water away from the work; use of pumping equipment may be required to dewater some areas.
- E. Discharge from dewatering operations shall be returned to natural drainage routes. Settling pits, silt fences, straw dikes, or other appropriate measures shall be taken to prevent highly turbid waters from entering existing ponds, streams, or wetlands and as required by state & federal regulations.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILL FOR UTILITIES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The Work under this item includes furnishing all labor, materials and equipment to perform all operations pertaining to trenching and backfill for utilities.

1.2 RELATED REQUIREMENTS

- A. Section 26 00 00 - Electrical Methods and Materials
- B. Section 31 23 00 - Excavation and Fill
- C. Section 33 52 13 – Liquid Fuel Piping

1.3 PROTECTION

- A. Protect equipment and vehicular traffic from trenches and excavations by providing adequate barricades and signage.
- B. Protect excavation side-slopes or adjacent structures by providing adequate back-slopes, shoring, bracing or other methods required to prevent failure of the excavation or existing soils.
- C. Protect all above and belowground utilities.
- D. Notify the Project Manager of unexpected sub-surface conditions and discontinue work in affected areas until notification is given to resume work.
- E. Grade top perimeter of the excavation to prevent surface water runoff from entering the excavation.
- F. Provide for dewatering of the trench where ground water is encountered.

1.4 QUALITY CONTROL ASSURANCE

- A. Moisture-Density test standard: ASTM D1557 or AASHTO T-180, Method D.
- B. In-place Density Determination: Nuclear Method ASTM D2922 or AASHTO T-238.
- C. Quality control monitoring of trench backfill materials and construction by certified independent laboratory approved by Owner, secured and paid for by the CONTRACTOR.
- D. Minimum frequency for testing is indicated below. Additional testing may be necessary depending on field conditions

1. Moisture Density and Gradation Analysis on Classified and Unclassified Materials: One (1) sample for approval, prior to use, plus one (1) additional sample when any change in material occurs which, in the opinion of the Project Manager, may significantly affect the optimum moisture content or maximum laboratory dry density.
2. In-Place Density – Trench Backfill:
 - a. One (1) test per lift for every 200 lineal feet of trench.

1.5 SUBMITTALS

- A. Moisture-Density test reports for backfill material from qualified testing laboratory.
- B. In-place density test results in approved format.
- C. If the CONTRACTOR changes the source and/or stockpile from which materials are obtained, Gradation Analysis and Moisture-Density test reports for these new sources shall be submitted to the Project Manager.
- D. The CONTRACTOR shall make allowances in his Bid for these items to cover expenses incurred for certified testing and no additional compensation will be allowed.

PART 2 – MATERIALS

2.1 TRENCH BACKFILL

- A. Material for trench backfill shall be obtained from the trench excavation.
- B. If the excavated material is unsuitable for trench backfill (contains organic matter, muck, peat, frozen materials, vegetation, debris or other unsuitable or deleterious matter), the Project Manager may direct the CONTRACTOR to furnish Classified Fill material.

2.2 LOCATOR/WARNING TAPE

- C. Metallic Locator/Warning tape shall be capable of being inductively detected electronically. Materials shall conform to the following:
 1. Film: Inert plastic. Each film layer shall be not less than 0.0005-inch thick (0.5 mil).
 2. Imprint: 3/4-inch or larger bold black letters.
 3. Legend: The buried utility line tape shall be identified with imprint such as "Caution: Water Line Below" and the identification repeated on approximately 24-inch intervals.

4. Metallic foil laminated between two layers of impervious plastic film not less than 2 inches wide. The adhesive shall be compatible with the foil and film. Total thickness of tape shall not be less than 0.005 inch (5 mil).

PART 3 – EXECUTION

3.1 PREPARATION

- A. Identify all existing underground utilities. Stake and flag their locations.
- B. Maintain and protect the existing utilities that may pass through the work area. The CONTRACTOR shall coordinate with AUTHORITY, the City, and the local utility company before excavating near utility poles. Temporary bracing of poles and the relocation of poles or guy-anchors shall be as directed by the utility company and approved by the Project Manager.

3.2 EXCAVATION

- A. Excavate the subsoil required for installing piping and conduits.
- B. Cut trenches sufficiently wide to enable proper installation and inspection of utilities as specified and shown on the Contract Drawings.
- C. Remove and dispose of all organic material and debris from trench excavation.
- D. Correct unauthorized excavation or over-excavated areas at no cost to the Owner.
- E. If the excavation encounters contaminated soils proceed in accordance with Specification Section "Excavation and Handling of Contaminated Material".

3.3 DISPOSAL SITES

- A. Except as otherwise stated, the CONTRACTOR shall make his/her own arrangements and assume all costs in connection with disposal sites. Disposal sites shall be located and maintained in such a manner as to prevent a public nuisance.
- B. If the disposal site is on private property, the CONTRACTOR shall obtain written permission from the property owner or owners for such disposal sites and shall furnish the Authority with a copy of this permission. The written permission shall specifically provide that the property owner will not hold AUTHORITY, its employees, agents, or engineers liable for use of or damage to this property. The CONTRACTOR shall be held liable for any trespass or property damage incurred outside of the disposal site.

3.4 TRENCH BACKFILL

- A. The first lift is to provide at least a 6-inch bedding thickness under the pipeline and shall be placed before the pipe is laid in the trench. Subsequent lifts of not more than 8-inches shall be installed and individually compacted to 95% of

maximum density as described in Section 31 23 00 Excavation and Fill, of these Specifications.

- B. No blocking of any type shall be used to adjust the pipe to grade.
- C. Where ground water is present, the CONTRACTOR shall provide drainage through pumping or ditching to ensure that the bedding does not become saturated before placement of the backfill material.
- D. The CONTRACTOR shall exercise caution when compacting above pipes to ensure that the pipes and coatings are not damaged by compaction and backfilling operations. All pipes or coatings damaged during backfill or compaction operations shall be repaired or replaced by the CONTRACTOR, at no expense to the Owner.

3.5 FIELD QUALITY CONTROL

- A. Notify the Project Manager at least 24 hours in advance of trench backfilling operations to allow for inspection. Failure to obtain inspection prior to placement of backfill may be cause for rejection of pipe.
- B. The results of each density test shall be recorded on a test sheet. The following information shall be recorded.
 - 1. Horizontal and vertical location.
 - 2. Density and percent of referenced standard compaction.
 - 3. Material description and appropriate compaction control standard

END OF SECTION

SECTION 32 05 09

GEOTEXTILE FABRICS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Work under this Section consists of furnishing all labor, equipment, supplies and materials necessary to perform all operations pertaining to the furnishing and placement of geomembrane liner and geotextile fabrics.
- B. Geomembrane liner is to be placed at locations shown in the contract drawings including within tank dike areas and beneath the powerhouse building.

1.2 RELATED REQUIREMENTS

- A. Section 31 23 00 - Excavation and Fill.

1.3 SUBMITTALS

- A. General: Conform to Section 01 33 23, Shop Drawings, Product Data and Samples.
- B. Furnish Manufacturer's Information and design data, including complete product installation instruction.

1.4 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Conform to Section 01 60 13, Material and Equipment.
- B. Packaging and Identification Requirements:
 - 1. Geomembrane and geotextile rolls shall be furnished with suitable wrapping for protection against moisture, contamination and extended ultra-violet exposure prior to placement.
 - 2. Each roll or bundle shall be labeled or tagged to provide product identification sufficient for field identification.
 - 3. Products shall be stored in a manner that protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

1.5 QUALITY ASSURANCE

- A. Manufacturer: The manufacturer of the geomembrane and geotextile materials shall have a minimum of ten years' experience in their respective fields.
- B. Sampling and Compliance Requirements:

1. A competent laboratory must be maintained by the producer of the fabric at the point of manufacture to insure quality control in accordance with ASTM testing procedures.
 2. That laboratory shall maintain records of its quality control results and provide, upon request of the specifying agent prior to shipment, a manufacturer's certificate.
 3. The certificate shall include:
 - a. Name of manufacturer.
 - b. Chemical composition.
 - c. Product description.
 - d. Statement of compliance to specification requirements.
 - e. Signature of legally authorized official attesting to the information required.
- C. CONTRACTOR shall hydrotest all containment areas prior to the placement of fill. The containment basin shall be filled to the top of the membrane liner and monitored for 24 hours. Report any fluctuations in the water level to the Owner. CONTRACTOR shall submit a minimum of three photos of each secondary containment areas taken during the hydrotest and a written report on the results of the hydrotests.
- D. Weather Limitations: All work shall be performed under weather conditions recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 GEOTEXTILE FABRIC

A. Woven Geotextile Fabric:

1. Geotextile Fabric shall be GEOTEX 315ST or approved equal.
2. The fabric shall be inert to naturally encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties in the following table.
3. The minimum average roll value (MARV) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the MARV stipulated herein.

SPECIFICATION PROPERTY	TEST LIMIT	METHOD
Grab Strength	300 lbs	ASTM D-4632
Trapezoid Tear Strength	100 lbs	ASTM D-4533
CBR Puncture Strength	900 lbs	ASTM D-4833

Survivability Class 2 AASHTO M288

B. Non-Woven Geotextile:

1. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, spun-bound, black, fuel resistant, and conform to the properties in the following table.
2. The average roll minimum value (weakest principle direction) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the average roll minimum value (weakest principle direction) stipulated herein.

SPECIFICATION PROPERTY	TEST LIMIT	METHOD
Grab Strength	150 lbs	ASTM D-4632
Grab Elongation	50% max	ASTM D-4632
Trapezoid Tear Strength	65 lbs	ASTM D-4533
Puncture Strength	90 lbs	ASTM D-4833
Mullen Burst Strength	315 psi	ASTM D-3786

3. Acceptable brands include:
 - a. Geotex 601, or approved equal.

C. Geomembrane Liner:

1. The geomembrane liner shall be 23-oz per square yard yellow, high strength polyester scrim coated liner with urethane which meets or exceeds the physical and low temperature properties of Cooley L1023DEP. Liner shall be specifically designed to resist long term exposure to hydrocarbons including gasoline and diesel. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties in the following table.
2. Geomembrane liners shall be ordered as one piece units. Seams shall be factory welded and certified prior to shipment.
3. Field verify size required and include excess to prevent binding and excessive stress.
4. Liner shall be protected and crated to prevent any damage during shipping.
5. Provide an unfolding map that indicates where the liner bundle needs to be positioned to allow for ease in unfolding at the site.
6. Install liner in accordance with the manufacturer's instructions.

7. Install liner between non-woven geotextile layers for protection.
8. The average roll minimum value (MARV) (weakest principle direction) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the average roll minimum value (weakest principle direction) stipulated herein.

SPECIFICATION PROPERTY	TEST LIMIT	ASTM METHOD
Grab Strength	450 lbs	ASTM D-751
Trapezoid Tear Strength	75 lbs	ASTM D-1117
Puncture Strength	600 lbs	ASTM D-751
Low Temperature Flexibility	-30oF	ASTM D-2136
Ply Adhesion	10 lbs	ASTM D-751

Acceptable Brands

- a. Cooley L1023DEP

2.2 LINER SEAMING

- A. Field seaming is prohibited unless approved in writing by the Owner. If approved, all field joints must be bonded by a qualified technician using manufacturers recommendations, material and equipment.

PART 3 - EXECUTION

3.1 INSTALLATION OF GEOTEXTILE FABRICS

- A. Preparation:
 1. Prepare subgrade and embankment as specified.
 2. Grade to a smooth surface, leaving no surface undulations or irregularities that the fabric can stretch and “bridge” over.
 3. Remove any loose and angular materials, rocks and sticks that may damage the fabric.
- B. Installation:
 1. The geotextile fabric sheet shall be unrolled, positioned, and drawn tight without stretching, in accordance with manufacturer’s recommendations.
 2. Geomembrane liner shall be crated to prevent any damage during

shipping. Provide an unfolding map which indicates where the liner bundle needs to be positioned to allow for ease in unfolding at the site. Install liner in accordance with the manufacturer's instruction by a certified installer. Install between layers of non-woven geotextile for protection.

3. No penetrations are allowed through the geomembrane liner except at the top of exterior dike wall.
4. Construction vehicles will not be allowed to travel directly on the fabric.
5. Take due care to ensure that fabric is not damaged during construction activities.
6. Fabric damaged to a degree that compromises its intended capabilities shall be replaced with same approved geotextile fabric at no additional cost to the Owner.

3.2 FILL PLACEMENT

- A. Fill or backfill placement shall be in accordance with Section 31 23 00 Excavation and Fill.
- B. A minimum of 6 inches of fill material shall be placed before any construction equipment is permitted to pass over the installed geotextile or geomembrane liner. At no time shall equipment be operated on the unprotected fabric.
- C. Care shall be taken to avoid tears or other damage to the fabric during placement. Tears or damage are cause for repair or replacement of the fabric at the CONTRACTOR's expense.

3.3 GEOTEXTILE FABRIC REPAIR

- A. If the geotextile becomes torn or damaged, it shall be repaired at the CONTRACTOR's expense prior to backfill operations.
- B. The fill material shall be cleaned from the surface of the geotextile and the torn area overlain with new fabric, providing a minimum of 3 feet of overlap around the edges of the torn area. Care shall be taken that the patch remains in place during subsequent fill placement.

3.4 GEOMEMBRANE REPAIR

- A. Any repairs made to the geomembrane liner shall be patched with the lining material and shall be performed by a qualified manufacturer technician in accordance with manufacturer instructions.
- B. The repaired lining shall retain its factory warranty and shall perform in "as new" condition. If the liner cannot be repaired to the satisfaction of Owner or if the repair is not covered under the manufacturer's warranty then the CONTRACTOR shall provide a new liner in place of the damaged one at no

additional cost to the project.

END OF SECTION

SECTION 32 31 13
CHAINLINK FENCES AND GATES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work covered by this Contract includes the furnishing of all labor, tools, equipment and materials necessary to design, fabricate, coat, package for shipment, and delivery, fence materials as shown on the attached Contract Drawings and described in this Specification.

1.2 REFERENCES

- A. The fence and materials shall be in accordance with this Specification, the Contract Drawings and with the following:
1. FS RR-F-191 – Federal Specifications and Standards. Fencing, Wire and Post, and Fabric

1.3 DEFINITIONS

- A. In this specification, the following words or expressions shall be understood to have the meaning given below:
1. Fence – Chainlink fencing, fabric, pipes, posts, plates, gates, wire, truss rods, fasteners, latches and other materials shown in the Contract Drawings and necessary to install fence.
 2. Temporary Security Fence - Chainlink fencing with galvanized steel posts constructed of new materials or previously used chainlink fence in good condition.
 3. Safety Fence - Orange fabric fence with t-posts.

1.4 SUBMITTALS

- A. The submittals include:
1. Product Data: Submit manufacturer's standard printed information and literature for all materials to be incorporated in the work.
 2. Shop Drawings: Submit dimensionally correct (scaled) shop drawings for all items to be fabricated (gates, etc.).
 3. Assembly procedures and standard details for the installation of all fence materials.

1.5 QUALITY ASSURANCE

- A. The manufacturer shall be experienced and regularly engaged in the supply and installation of fence materials. The manufacturer shall understand the

system design and its intent and shall produce components suitable to accomplish that intent. Any deficiencies in the Contract Drawings or these Specifications which may jeopardize the performance of the system shall be brought to the immediate attention of the PROJECT MANAGER, prior to submittal of product description and information for acceptance, whenever possible.

1.6 IDENTIFICATION

- A. All fence materials for each facility shall be marked with an identifying number that identifies which facility and component of the fence they pertain to.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Packaging:
 - 1. CONTRACTOR shall verify shipping dimensions and weight limitations with shipper to ensure that the receipt and delivery of materials will not require the use of specialized equipment.
 - 2. Packing must meet the shipping requirements of all anticipated carrier(s) and be adequate to protect the materials from being damaged.
 - 3. Individual packages/crates must be limited to three thousand pounds (3,000) gross weight and be suitable for lifting by forklift and cable sling.
 - 4. CONTRACTOR shall provide packing lists with all bundles and packages which shall list all materials contained in the package or bundle. Packing list shall be securely attached to each bundle in a watertight carrier.

PART 2 - PRODUCTS

2.1 NEW FENCING MATERIALS, POSTS AND ACCESSORIES

- A. Zinc-Coated Steel Wire Fabric:
 - 1. Type 1-1.2 oz/sq ft , 2-inch mesh, 9 gauge
 - 2. Fabric selvage to be twist, twist.
 - 3. Provide three strands of 12.5 gauge, 4-point, class III barb wire.
- B. Tension Wire for top and bottom of Fabric: 7 gauge, coil spring steel, Class III
- C. All pipe should be SS40 Standard Fence Pipe. Posts and Braces (Class 1, zinc-coated steel pipe, Grade A or B):
 - 1. Line Posts: 2.375-inch O.D. and weight of 3.12 lb/ft.
 - 2. End, Corner, Man Gate and Pull Posts: 2.875-inch O.D. and weight of 4.64 lb/ft.

3. Gate Posts: 4-inch O.D. and weight of 6.56 lb/ft.
4. Brace Rail: 1.66-inch O.D. and weight of 1.84 lb/ft.
5. Top Rail: Use top Tension wire unless otherwise noted.

D. Gates:

1. Size and type shown on Drawings.
2. Class 1 steel pipe, Grade A or B, 1.90-inch O.D. and weight of 2.28 lb/ft.
3. Gate leaves 6 feet wide and wider shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.
4. Gate leaves less than 6 feet wide shall have truss rods or intermediate braces.
5. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted.
6. All hardware shall be zinc-coated.
7. Latches:
 - a. Frost free or strongarm latch for double gates, fork latch for single man gates.
 - b. Latches shall be arranged for pad-locking so that the padlock will be accessible from both sides of gates.

E. Accessories: Ferrous accessories shall be zinc-coated steel.

1. Tension bars: 1/4 -inch x 3/4-inch flat bar.
2. Standard tension bands: 1/8-inch x 1-inch with 5/16-inch carriage bolt.
3. Wire Ties and Clips: 9 gauge.
4. Steel Hog Rings: Aluminum or steel post ties
5. Truss Rods: 3/8-inch diameter.

F. Zinc Coating:

1. All steel and iron parts will be zinc-coated after fabrication in accordance with FS RR-F-191.
2. Weight of zinc coating per square foot of actual surface shall average not less than 1.2 ounces and no individual specimen show less than 1.0 ounce.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install posts, fabric, gates and accessories in accordance with ANSI/ASTM F567 and the manufacturer's instructions.
- B. Repair damaged galvanized surfaces with an approved cold galvanizing compound in accordance with manufacturer's instructions.

3.2 POSTS

- A. Spacing: Space posts equidistant measured on a horizontal line; on straight runs, space at 10 feet maximum.
- B. Location:
 - 1. Locate terminal posts (end, corner, and gate) at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments.
 - 2. On straight runs, brace posts in two directions to act as pull posts.
- C. Setting:
 - 1. Set posts plumb and to the depth shown on the Drawings.
 - 2. Posts to be placed to minimum 5-foot embedment or as indicated on the Drawing.
- D. Testing:
 - 1. Fence post rigidity shall be tested by applying a 50-pound force on the post, perpendicular to the fabric, at 5 feet above ground
 - 2. Post movement measured at the point where the force is applied shall be less than or equal to $\frac{3}{4}$ -inch from the relaxed position.
 - 3. Every tenth post shall be tested for rigidity; when a post fails this test, further tests on the next four posts on either side of the failed post shall be made. Posts failing the rigidity test shall be buried deeper or anchored with a minimum of 1 cubic foot of 2500 psi concrete placed at the base of the post.

3.3 INSTALLING FABRIC

- A. Place fabric on the outside of posts around the area enclosed.
- B. Cut fabric by untwisting a picket, and attach each span independently at all terminal posts.
- C. Attach one end and then apply tension to remove all slack and attach other end, using stretcher bars with tension bands at maximum 15-inch intervals or any other approved method.

- D. The installed fabric shall have a smooth, uniform appearance, free from sag.
- E. Install fabric 2 inches above ground level with a tolerance of plus or minus 1-inch at each post.
- F. Fasten fabric to line posts at intervals not to exceed 15 inches and to the top and bottom tension wires at intervals not to exceed 24 inches.
- G. Join sections of fabric by weaving a single picket into the ends of the rolls to form a continuous mesh.

3.4 BRACES AND TRUSS RODS

- A. Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished.
- B. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed.
- C. Braces and truss rods shall extend from terminal posts to first line post.
- D. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal.

3.5 TENSION WIRES

- A. Tension wires shall be installed along the top and bottom of the fence line and attached to the terminal posts of each stretch of the fence.
- B. Top tension wires shall be installed within the top 4 inches of the installed fabric.
- C. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric.
- D. Tension wire shall be pulled taut and shall be free of sag.

3.6 GATES

- A. Install plumb with tops of posts level with each other.
- B. Gate fabric shall be the same design and height of line fence fabric, furnished with twisted selvage top and bottom.

3.7 INTERMEDIATE CLIPS

- A. Install as detailed in the Contract Drawings.
- B. Intermediate clips shall be installed at the mid-span of each bottom tension wire, between posts.

3.8 GROUNDING

- A. Electrical grounds shall be installed along the fence between gate openings, at locations shown on the Plans. Electrical grounds shall also be installed where a power line passes over the fence.

3.9 TEMPORARY FENCE

- A. The CONTRACTOR shall furnish, install, and maintain a 6-foot temporary fence to provide a continuously secure and enclosed area around the project site during construction activities. Temporary fencing shall be chainlink with galvanized steel posts constructed of new materials or previously used chainlink fence in good condition. Posts shall be galvanized steel pipe of adequate diameter to provide rigidity. Posts shall be mounted on concrete footings or driven into the ground such that the fence cannot be knocked down by wind or pedestrians. Fabric shall be woven vinyl coated or galvanized steel mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

Install temporary fence in locations shown on Drawings or as proposed by the CONTRACTOR and approved by the Project Manger that maintains job site security and meets Owner's needs. Install posts at 10-foot maximum spacing and securely fasten fabric. There shall be less than 6 inches of clearance between fence fabric and grade. Posts and fabric shall be secured such that they cannot be easily moved or separated for pedestrian access. Install fence in straight lines with no gaps. Temporary security fencing shall be maintained during working and non-working hours. Maintain fence in good condition and immediately repair any damaged fence sections.

Temporary fence shall be replaced by permanent fence prior to project completion as detailed in the drawings.

END OF SECTION

SECTION 32 31 14

DRAIN PIPE

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The Work under this Section consists of the performance of all operations pertaining to Furnishing and Installing Pipe for storm drain systems.

1.2 RELATED REQUIREMENTS

- A. Section 31 23 00 - Excavation and Fill.

1.3 SUBMITTALS

- A. General: Conform to Section 01 33 23, Shop Drawings, Product Data and Samples.
- B. Furnish Manufacturer's Information and design data, including complete product installation instruction.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All piping shall be in accordance with the Contract Documents conforming to the size and class shown and specified. Changes in class shall be made within one-half of a pipe length of the station indicated on the Drawings.
- B. Corrugated Polyethylene Pipe (CPEP)
Corrugated Polyethylene pipe shall conform to the following specifications:
 - 1. Three inch through ten inch (3" through 10") diameters: the requirements of AASHTO M-252.
 - 2. Twelve inch (12") and larger diameters: the requirements of AASHTO M-294. The corrugated Polyethylene Pipe covered by these specifications is classified as follows:

Type C - This pipe shall have a full circular cross-section with a Corrugated surface both inside and outside. Corrugations may be either annular or helical.

Type S - This pipe shall have a full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner. Corrugations may be either annular or helical.

Type CP -This pipe shall be Type C with Class 2 perforations.

Type SP - This pipe shall be Type S with Class 2 perforations.

All CPEP fittings shall be rotational or blow molded and shall conform to the fitting requirements of AASHTO M-252 or M-294. Contractor shall join CPEP segments per the manufacturer's recommendations.

When a bell and spigot joint is utilized, the Contractor shall ensure that the rubber gasket is correctly inserted into the joint and that the bell is on the upstream end of the pipe.

For connections not using manufactured couplings, the Contractor shall join three inch to ten inch (3" - 10") CPEP with couplings corrugated to match the pipe corrugations or with push-on couplings with locking devices. Contractor shall join twelve inch (12") and larger CPEP with couplings, corrugated to match the index in the pipe corrugations and in a width not less than three-quarters (3/4) of the nominal pipe diameter.

All couplings shall be manufactured to lap equally to a distance on each jointed pipe and shall provide a positive means of closure. All flared end sections and saddles shall be constructed of the same material as the pipe and shall be factory assembled units to serve as structural, hydraulic, and/or aesthetic end treatment to CPEP culverts.

CPEP connections shall be as recommended by the manufacturer. The cost of the end section and saddles shall be incidental to the pipe. CPEP may be connected to CMP or may be used between or connected to dissimilar metals. When CPEP is used as a connection, the Contractor shall construct the connection utilizing a joint specifically manufactured for that type of connection or shall construct the connection in accordance with Manufacturer's Instructions. Contractor shall not insert any portion of the bell of CPEP pipe into any manhole, catch basin, or catch basin manhole unless that portion will be completely removed when the pipe is trimmed to two inches (2") inside the manhole in accordance with Manufacturer's instructions.

PART 3 – CONSTRUCTION

3.1 EXECUTION

A. Excavation and Backfill - Excavation and backfill for furnishing and installing pipe shall be in accordance with Div 31 23 00, Excavation and Fill.

B. Pipe Grade and Alignment:

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

Allowance:

Diameter (Inches)	Tolerance (Feet)
8	0.03
10	0.03

12	0.03
14	0.04
16	0.04
18*	0.05

*Note: For all pipe sizes over eighteen inches (18") in diameter, tolerance not to exceed five-hundredths feet (0.05'). For all pipe sizes less than 8-inches in diameter slope pipe to drain to sumps.

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

The Contractor shall exert due care in handling the precoated corrugated metal pipe or while placing bedding and/or filter material around the pipe so as not to damage the coating or crush the pipe. The Contractor shall obtain a liquid coating supplied by the precoated corrugated metal supplier which will be painted over scratched or cut sections of the pipe.

C. Pipe Laying

CMP and PCMP pipe shall be laid in Class C Bedding and CPEP and HDPEP pipe shall be laid in Class D Bedding unless otherwise required by the Contract Documents or directed by the Engineer.

Pipe laying shall in all cases proceed upgrade. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. The alignment of the installed pipe shall appear straight to visual observations and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference. Each section of pipe shall be handled carefully and placed accurately. Each section of pipe shall be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity. On helical pipe, the laps shall not impede the flow and all seams shall be aligned uniformly for the length of the run. At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substances shall enter the pipe or fittings. All pipe shall be laid in accordance with the respective manufacturer's recommendations. Pipe shall not be laid when the bottom of the ditch or the sides to one foot (1') above the pipe are frozen. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that the temperature of the material near the pipe goes below freezing.

END OF SECTION

SECTION 33 05 00
COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. All work specified in Division 33.

1.2 SCOPE OF WORK

- A. This section and Division 33 applies to bulk fuel tank farms, dispensers, bulk fuel transfer systems, and utilities.
- B. Provide the new facilities as shown and specified, including the following:
 - 1. Construct all new work providing complete and operating systems.
 - 2. Furnish and install Mechanical systems, including:
 - a. Exterior Fuel Piping, Tanks, and Fuel Equipment.
 - b. All appurtenances, accessories, fittings, valves, dampers, and devices related to fuel systems.
 - c. Fuel System Start Up.
 - d. Training and warranty.
- C. All equipment and installation shall be in compliance with OSHA regulations.
- D. Intent:
 - 1. The Intent of the Contract is to include all labor and materials, tools, hoisting, scaffolding, supervision, equipment, and transportation necessary or reasonably inferable as being necessary for the execution of the work.
 - a. The Contract Documents endeavor to communicate intended completed work. Interim stages, methods, and means may not be specifically indicated where such is reasonably inferable by qualified Contractors and workers.
 - 2. The Contractor is responsible for providing the finished work, tested and ready for operation.
 - 3. By submitting a proposal, the Contractor represents that they has made a thorough examination of the site, of the work, and all existing conditions and limitations, and that they have examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient,

adequate and satisfactory for the execution of the work under the Contract.

4. Where minor adjustments of the work are necessary for purposes of fabrication, scheduling, or installation of items, for accommodation of site conditions reasonably inferable for this project, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments at no added expense to the Owner.
 - a. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Owner's Representative for review and approval.

1.3 COORDINATION

- A. Contractor shall be thoroughly acquainted with the work involved and shall verify at the site those measurements necessary for proper installation of the work.
- B. Contractor shall refer to engineered drawings for site and building construction and other details which affect the mechanical installation.

1.4 DEFINITIONS AND ABBREVIATIONS

- A. Contractor: The word "Contractor," as used in these Specifications, means the mechanical subcontractor.
- B. Owner's Representative: The person or entity designated by the Owner. It may be different persons or entities for different applications.
- C. Provide: The word "provide," as used in these Specifications, means furnish and install, complete and ready for the intended use.
- D. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- E. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Owner's Representative and similar phrases.
- F. Specialist: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

1.5 STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. General: At all times take such precautions as may be necessary to properly protect all material and equipment from damage.
 - 1. Cap, plug, or otherwise protect all temporary openings in materials and equipment to prevent entry by foreign matter.
 - 2. Protect from injury by others.
- B. Keep installations clean.
 - 1. Restore installations including piping and equipment, which is damaged by any means including weather, rust, paint, dirt, and physical damage or to new condition prior to installation. Replace rejected piping, equipment, etc. with new materials.
 - 2. Deliver systems to Owner with clean filters, clean strainers, and all bearings properly lubricated.
- C. Cover stored materials and specialties to protect from moisture and dirt. Elevate above grade.
 - 1. Retain protective covers and caps on materials and equipment when provided by manufacturers.
- D. Store equipment a minimum of 2 feet above ground and under protective cover. If storage location is subject to moisture, keep covered with plastic sheeting, arranged to provide adequate ventilation and prevent trapping of moisture.
 - 1. Cover all motors and bearings with watertight and dustproof covers during storage and construction.
- E. Rejected items shall remain property of Contractor.

1.6 SEQUENCING AND SCHEDULING

- A. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.
 - 1. Sequence mechanical equipment installation with other site work.
 - 2. Coordinate connection of electrical services.
 - 3. Coordinate with other trades to maintain access routes to mechanical systems.
- B. Schedule inspections and tests of mechanical materials and equipment while they are exposed.
 - 1. If defective installations are discovered or suspected by Owner, uncover

work for inspection and correction of defective condition.

1.7 SAFETY AND PROTECTION

- A. Safety Measures to be Taken: The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Comply with "Safety and Health Regulations for Construction," Volume 36, No. 75, Part II of the Federal Register by the U.S. Department of Labor. Contractor shall be responsible for providing all such safety measures and shall consult with the state or federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist or whether it is or is not in compliance with state or federal regulations.
 - 1. The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences, or procedures required for the Contractor to perform its work. The Engineer's observations of the Contractor's performance are not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.
- B. Drive Guards: Provide OSHA-approved drive and shaft guards for all exposed, rotating drive shafts and drive connections between motors and driven equipment including fans, pumps, compressors, etc. Guards shall include heavy-duty steel frames securely fastened for easy removal to the equipment frame. Guards, in general, shall be solid sheet metal with tachometer cutout at shafts where applicable. Fan belt guards shall be heavy mesh or expanded metal to permit airflow. Guards may be provided by the equipment manufacturer or fabricated by this Contractor to the manufacturer's clearances, configurations, etc.

1.8 CODES, PERMITS, AND INSPECTIONS

- A. Work shall be installed in conformity with applicable local ordinances and state statutes. Standards and sizes which meet or exceed preceding requirements shall be installed as indicated.
- B. Give necessary notices, obtain permits, and pay taxes, fees and other costs, including utility connections or extensions for the work. File necessary plans, prepare documents and obtain necessary approvals of governmental departments having jurisdiction. Apply for and pay for all utility meters and gauges required. Obtain required certificates of inspection for work; retain in the Project Closeout manual and deliver to the Owner's Representative before request for acceptance and final payment for the Work.
- C. Comply with laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the work.
- D. Material and equipment within the scope of the UL Testing Laboratory Service

shall be listed by the Underwriters Laboratories for the purpose for which they are used and shall bear their listing mark.

- E. Contractor shall call for all inspections by the authority having jurisdiction when they become due and shall not cover any work until approved by the governing authorities.

1.9 QUALITY ASSURANCE

- A. Single Source Responsibility: Comply with the requirements specified in Division 01 Section, "Materials and Equipment".
- B. Warranty: Products, material, and installations shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve (12) months from the date of acceptance. Any portion of the work repaired or replaced under warranty shall be warranted for the remainder of the original warranty period.
 - 1. Certain items have longer warranty requirements stated in their respective specification sections. The foregoing shall not limit such warranties, and the longer warranty provisions shall apply.
- C. Unless otherwise indicated or specified, all materials shall be new. Contractor shall properly store all materials and equipment for protection from physical damage or damage due to corrosion.
- D. Standardization of Manufacturer: This Contractor shall make every effort to furnish all equipment of any equipment type (such as all fans, all motors, all motor controls, all pumps, all valves, and etc.) from one manufacturer. Confirm before ordering, requirements of standardization with Owner's existing equipment.
- E. Rigging and Appliances: Provide all rigging, scaffolding, staging, and ladders required for complete installation of all equipment.
- F. Manufacturer's Directions: Each material for which the manufacturer issues written directions shall be used according to its manufacturer's directions, as approved and if not at variance with these specifications.
 - 1. If manufacturer's directions are at variance to the contract documents, install to the more stringent requirement within the terms of the manufacturer's warranty. If warranty conflicts arise, refer the question to the Owner's Representative before proceeding.
- G. Equipment Furnished by Others: For installation of equipment and casework furnished by others and installed by this Contractor, roughing-in dimensions shall be obtained from approved shop drawings, by measurements from the actual equipment, details shown on drawings, or as directed by Owner's Representative.
- H. Accessibility: Install all equipment to be easily accessible for operation,

maintenance, or repair. Equipment deemed inaccessible shall be relocated as directed.

- I. Drawings and specifications shall be taken together. Provide work specified and not drawn or work drawn and not specified as though mentioned in both.
- J. General Locations and Arrangements:
 1. Drawings (plans, schematics, and diagrams) indicate general location and arrangement of fuel systems and utilities and do not attempt to show exact details or all offsets in piping. Do not scale drawings to obtain final cut lengths, quantities, or the like. Examine the site drawings for exact location of tanks and equipment.
 2. Indicated locations and arrangements were used to size ducts and pipe and to calculate friction loss, expansion, and other design considerations. Install systems as indicated, unless deviations to layout are approved in advance on coordination drawings.
 3. Follow drawings in laying out work and check drawings of other trades to verify locations in which work will be installed. Install piping in such a manner as to conform to site conditions, structure, avoid obstructions, and keep openings and passageways clear. Lines that must pitch, or that must have a constant elevation, shall have the right-of-way over lines not so restricted. If site conditions appear inadequate, notify the Owner's Representative before proceeding with the work. Make reasonable modifications in the work without extra cost as needed to prevent conflict with work of other trades and for proper execution of the work.
 4. Site Conditions: The design documents indicate certain site conditions to assist the Contractor. These drawings are not intended to indicate all conditions. It shall be the responsibility of the Contractor to verify all site conditions and include the removal or relocation of equipment, piping, and wiring in the Contract.

1.10 SUBSTITUTIONS

- A. Brand Names: The use of brand names is for the purpose of description and establishing quality and does not eliminate the requirements of meeting specifications.
- B. Exceptions: Other brands will be allowed except where an item or class of material is specified exclusively by trade name and followed by word "only."
- C. Requests for Substitutions: Approval of alternative and/or substitute products will be considered only under terms and conditions specified in Division 01.
- D. Changes Due to Substitutions: Design is based on equipment as listed in the equipment schedules and/or specified elsewhere in Division 23. Where implementation of an approved substitution requires redesign to any part of

the work, provide such redesign. Obtain approval of redesign from the Owner's Representative. Redesign cost and additional construction cost, including related and incidentally affected work, resulting from the redesign shall be at the Contractor's expense.

1.11 SUBMITTALS, APPROVALS, AND REVIEWS

- A. Provide submittals for all products and systems described in Division 33 and shown on the drawings to demonstrate compliance with the requirements of the project. Furnish equipment submittals, include data for review, and organize data in the manner described below. Submittals procedures shall comply with applicable requirements of Division 1 specifications.
- B. Review of submittals will not relieve the Contractor of responsibility for dimensions and/or errors that may be contained in them, or deviations from the Contract Documents' requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the submittals, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the submittals.
 - 1. Submittals processed by the Owner's Representative and/or Architect/Engineer design team are NOT Change Orders. The purpose of Contractor Submittals is to demonstrate to the Architect/Engineer design team that the Contractor understands the design concept and demonstrates its understanding by indicating which equipment and material it intends to furnish and install and by detailing the fabrication and installation methods it intends to use.
- C. General: Submittals shall be legible. Degraded faxes, faded or smudged literature, or literature too tiny as to be reasonably read if reproduced at ½ size will be rejected without further review.
 - 1. Contractor further agrees that if deviations, discrepancies, or conflicts between Submittals and Specifications are discovered either prior to or after Submittals are processed by the Architect, the Design Drawings and Specifications shall govern and shall be followed.
- D. Product Literature Requirements:
 - 1. Provide all submittals electronically. Indicate the following:
 - a. Contractor's name and contact information; and project title on the cover page.
 - b. Table of contents.
 - 1) List sections and each item in the section.
 - c. Divide the submittals into sections by specification section. Place a numbered divider between each section.
 - 1) Table of contents for each section.
 - 2) Place each submitted item within its specification section.
 - 3) Include a separate section for items indicated on the drawings only.

- d. On each item or product, customize the submittal to thoroughly convey the contractor's intent. The terminology "As Specified" used without marked up listing is not acceptable. (Show exactly what will be provided to include options or deletions.)
 - 1) Mark submittal literature to indicate the make and model, materials, accessories, and options proposed. Cross out those not proposed. Unmarked literature indicates ALL accessories options will be provided.
 - 2) Identify each item. Mark the project Tag or ID. Mark the specification reference and/or drawing reference which the submittal satisfies.
 - 3) Mark the manufacturer's name and address, and supplier's name, address and phone number.
 - 4) Rough-in data and dimensions.
 - 5) Operating characteristics.
 - a) Performance curves and rated capacities. Indicate the point on the performance curve which satisfies the contract requirements.
 - b) Temperature range and limitations, if applicable.
 - c) Motor and electrical characteristics.
 - d) Wiring diagrams for the specific system operation.
 - 6) Indicate whether item is "As Specified" or "Proposed Substitution".
 - a) For substitutions, indicate any deviations from the specified item on the submittal. Include physical size, materials, and performance characteristics, as well options and features.
 - 7) Working construction drawings (shop drawings) for other than stock manufactured items.
- E. Partial Submittals are permitted with cause only after prior approval such as for long lead items require special attention. Piecemeal submittals, and submittals not organized and tabbed by specification section will be returned without review.
- F. Shop Drawing Requirements:
 - 1. Shop Drawings are for the benefit of the contractors to resolve spatial conflicts and appropriate design before the opportunities for acceptable solutions diminish. They are to convey work customized by the tradesmen for this project including, but not limited to, layouts of assemblies of field-fabricated components, pipe, and equipment
 - a. Spatial conflicts which arise as the project progresses which have not first been addressed by shop drawings are expressly assigned to the contractor for resolution within the contract requirements without additional cost to the owner.
 - b. Where work obstructs the space needed for O&M, work shall be removed and redone to satisfy O&M spatial requirements without additional cost to the owner.

2. Shop Drawings utilizing manufactured equipment shall be reviewed by the manufacturer to determine correct product application before submitting. The manufacturer's determination shall be evident on the submitted shop drawing.
3. Shop drawings shall be drawn to scale by skilled drafters to conventions and norms prevailing in the field of architectural drafting. Specialized terms, symbols, and techniques which add accuracy and concisely convey the intent are encouraged.
 - a. Shop Drawings shall include horizontal and vertical dimensions. Multiple views (top, side, front, cross-section, isometric, and etc) shall be used if necessary to illustrate the purpose of the Shop Drawing.

1.12 OPERATION AND MAINTENANCE MANUALS

- A. Provide Operation and Maintenance (O&M) Manuals for all products and systems described in Divisions 33 and shown on the drawings. Furnish in time for training of Owner's personnel in operation and maintenance of systems and related equipment. O&M submittal procedures shall comply with applicable requirements of Division 1 specifications and this section.
- B. Operating and Maintenance Sequence and Procedures:
 1. All written information shall be typewritten. Handwritten notes, lists, or the like will not be accepted.
 2. Contents: In each chapter, describe the procedures necessary for personnel to operate the system and equipment covered in that chapter. Provide procedures for start-up, operation, emergency operation, and shutdown.
 - a. Start-up: Give complete step-by-step instructions for initial energizing equipment, making initial settings and adjustments whenever applicable.
 - b. Operation: Give instructions for continued operation including ongoing settings. Commands, overrides, and adjustments whenever applicable.
 - c. Shutdown Procedure: Include instructions for stopping and securing the equipment after operation. If a particular sequence is required, give step-by-step instructions in order.
 - d. Emergency Operation: Give detailed instructions for emergency procedures required to prevent damage to equipment and property, etc.
 - e. Provide a schedule of preventive maintenance for each product. Recommend frequency of performance for each preventive maintenance task; i.e., cleaning, inspection, etc.
 - f. Provide instructions and schedules for all routine cleaning, lubrication and inspection with recommended lubricants for all equipment and systems. Schedule times of the year that

- inspection and maintenance should be performed.
 - g. Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment, and which require no extensive special training or skills.
 - h. Special Maintenance: Provide all information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.
- C. Manufacturer's Catalog Cuts: Include manufacturers' descriptive literature covering all appurtenances used in each system, together with illustrations, exploded views and renewal parts lists. Include name, address and phone number of supplier.
- D. Shop Drawings: Provide a copy of all corrected, approved shop drawings covering equipment for the project either with the manufacturers' catalog cuts or properly identified in a separate subsection.
- E. Spare Parts Lists: Include a list of all equipment furnished for project, with a tabulation of descriptive data of all the spare parts proposed for each type of equipment or system. Properly identify each part-by-part number and manufacturer, include address and phone number.
- F. Other Items:
- 1. Valve Directory: Indicate valve number, size, location, function and normal position for each numbered valve.
 - a. Provide a complete Valve Directory in the O&M Manual.
 - 2. Name Plate Directory: Provide list of fans, pumps, automatic dampers, and all other major equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, normal position of switch, and equipment label designations specified. Submit directory for review and obtain approval prior to substantial completion of project.
- G. Number all pages to assure correct placement in manual.

1.13 OPERATING PERSONNEL INSTRUCTION

- A. General: Provide instruction of all pertinent mechanical systems to facility operating personnel prior to facility acceptance, upon mutually satisfactory arrangement with Owner.
- 1. Instruction: Instruction shall begin only after the component, assembly, or system is complete and has been tested and is in acceptable operating condition. Instruction shall encompass normal operation, emergency operation, fire and other hazards, safety provisions, pollution prevention provisions, and maintenance procedures for all work provided.

2. Instructors: Instructors shall be qualified on the system being instructed. Include the Contractor's staff supplemented by authorized representatives of the component, assembly, or system manufacturer.
3. Aids: Instruction process shall utilize the O&M manuals which, if deemed unsatisfactory in any content, shall be supplemented in a manner to achieve useful, pertinent, and complete instruction.
4. Time: Provide all necessary instruction to the complete understanding of the operating personnel. No individual session shall last more than 4 hours per day. Minimum total instruction periods shall be as follows except that where instruction periods for longer terms are specified herein, such longer term shall apply:
 - a. Piping, and Tanks systems: 8 Hours.
 - b. Controls: 16 hours.
5. Statement of completion: At the conclusion of each training session, provide the Owner's Representative with a form containing the following information:
 - a. Name and contact information of Trainer, including company represented.
 - b. Name of each trainee.
 - c. Date of the training.
 - d. Relevant specification section satisfied by the training.
 - e. Time spent in classroom training and in hands-on practical training.
 - f. Signature of trainees confirming delivery and time of training.

1.14 CONTINUITY OF SERVICE FOR EXISTING SERVICES

- A. General: Comply with all Division 01 requirements.

1.15 PROJECT CLOSEOUT

- A. General: Comply with all Division 01 requirements.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION—COMMON REQUIREMENTS

- A. Equipment Connections:
 1. Provide piping flanges where necessary for access to equipment.
 - a. Provide flanges so equipment can be disconnected without dismantling the piping system.
 - b. Make up all piping connections to equipment with offsets arranged that the equipment can be serviced or removed without

- dismantling the piping beyond the flanged connections.
 - c. Welded piping systems: Wherever a welded piping system connects to equipment, valves, or other units which may require maintenance, servicing, or removal, the connecting joint shall be flanged.
- B. Install equipment in serviceable locations.
 - 1. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - a. Install equipment with clear access routes.
 - b. Maintain access route to equipment, and coordinate with other trades to prevent blocking these routes by other work.
 - 2. Extend grease fittings to an accessible location.
- C. Install equipment according to approved submittal data and the manufacturer's or governing trade association's written instructions. Portions of the Work are shown only in diagrammatic form.
- D. Install equipment level and plumb, parallel and perpendicular to tanks and buildings on site.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.2 EQUIPMENT NAMEPLATES AND OPERATIONAL TAGS

- A. Provide identification nameplates for all equipment, valves, tanks, etc.
- B. Material : 3"x5"x0.08" aluminum w/ 3/16" diameter holes drilled in each corner, black Gerber thermal transfer film printed letters on Gerber 220 high performance vinyl background, color as indicated, one side only, as manufactured by Warning Lights of Alaska or approved equal.
- C. Color:
 - 1. Nameplates: White background with black lettering.
 - 2. Operational Tags:
 - a. Diesel components: Apple green background with black lettering.
 - b. Gasoline components: Red background with black lettering.
- D. Information:
 - 1. Nameplates: Provide nameplates for all pumps, electrical panels, and other components as required on the Contract Drawings.
 - a. Nameplates to include component ID as shown on the Contract Drawings.

2. Operational Tags: Provide operational tags for components as shown on the Contract Drawings.
 - a. Operational tags to include component ID (MV-1, etc), normal operating condition (normally open or closed), component owner and information required for proper operation.

3.3 MECHANICAL DEMOLITION

- A. General: Perform demolition to minimize damage to adjacent work or systems to remain intact. Comply with OSHA and this project's safety regulations in performance of demolition.
 1. Employ safety precautions throughout the demolition process.
 - a. Wear the appropriate OSHA-approved PPE for the processes employed.
 - b. Evaluate the demolition for hazardous materials. If a material is in question, notify the Owner's Representative.
 2. Remove systems completely, leaving no materials in the demolition zone abandoned in place.
 - a. Cap any adjacent piping left in place.
 3. Collect and remove demolished materials and debris regularly, but no less than once per day.
 - a. Leave demolition areas safe and clean whenever not continuously occupied by work crews.

3.4 TOUCH-UP PAINTING

- A. For minor repairs to surfaces scratched during shipping and installation.
 1. Repair all dings and scratches to original color and luster.
 2. Repair corrosion protection on metallic surfaces to match manufacturer's original.

3.5 CONNECTING EQUIPMENT FURNISHED UNDER OTHER DIVISIONS

- A. Provide rough-in and final piping connections to equipment as listed in specifications and equipment schedules.
 1. Obtain all rough-in data from approved shop drawings on all equipment.
 2. Equipment and fixtures furnished under other divisions will be received, uncrated, and set in place under other divisions unless specifically noted otherwise in Division 33 or on the drawings.
 3. Make required piping connections to equipment furnished under other divisions including, but not be limited to, installation of all fittings, strainers, valves, instruments, safety devices, and other piping

appurtenances provided with or as an integral part of equipment.

END OF SECTION

SECTION 33 52 13
LIQUID FUEL PIPING & DISPENSING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Follow all provisions of Section 33 05 00, "Common Work Results for Utilities."

1.2 WORK INCLUDED

- A. Work under this section shall include furnishing all labor, materials, tools, and equipment necessary for the complete installation of the fuel system. Work shall include, but not be limited to, the following:
 - 1. Piping and Fittings.
 - 2. Piping Specialties.
 - 3. Fuel Appurtenances.
 - 4. Dispensing & POS System
 - 5. Pipe Supports.
 - 6. Pipe and Pipe Support Coatings.

1.3 SUBMITTALS

- A. Submit each item specified in this Section according to the Conditions of the Contract and Division 01 Specification Sections and Section 33 05 00, "Common Work Results for Utilities".
- B. Provide a product list which identifies the products intended to satisfy the requirements of this specification. Catalog cuts for each product shall be included with the product list.
- C. Product Data: Provide manufacturer's literature and data indicating dimensions, rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- D. Submit shop drawings: indicate piping layout, required clearances, and location and size of field connections.
- E. Pipe coating process and schedule.
- F. Inspection and Testing Procedures and Results.
- G. Welding procedure qualification Records (PQRs) and welding procedure

specification.

1.4 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. B1.20.1, Pipe Threads, General Purpose (Inch).
- B. American Society for Testing Materials (ASTM):
 - 1. A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - 2. A105, Specification for Forgings, Carbon Steel, for Piping Components.
 - 3. A106, Standard for Seamless Carbon Steel Pipe.
 - 4. A181, Forgings, Carbon Steel, for General Purpose Piping.
 - 5. A183, Carbon Steel Track Bolts and Nuts.
 - 6. A234, Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- C. American Society of Mechanical Engineers (ASME):
 - 1. ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
 - 2. ASME B31.9, Building Services Piping.
 - 3. B16.3, Malleable-Iron Threaded Fittings.
 - 4. B16.5, Pipe Flanges and Flanged Fittings.
 - 5. B16.34, Valves—Flanges, Threaded, and Welding End.
 - 6. B16.39, Pipe Unions, Malleable Iron Threaded.
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 30, Flammable and Combustible Liquids Code.
 - 2. NFPA 31, Standard for the Installation of Oil Burning Equipment.

1.5 QUALITY ASSURANCE

- A. Piping, fittings, and valves manufactured or procured from sources beyond territorial boundaries of the United States will not be acceptable.
- B. Comply with all applicable local and state codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances shall govern.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials shall be new unless otherwise specified. All items of the same type shall be of the same manufacturer.

2.2 PIPING AND FITTINGS

- A. Exterior Above Grade Piping: Seamless carbon steel pipe, Grade B, with plain bevel ends, meeting the requirements of ASTM A106B.
1. 3-inch diameter and larger within diked areas: Schedule 40
 2. All other piping: Schedule 80, except 1 inch diameter and smaller shall be schedule 160.
 1. All piping & fittings shall be buttwelded or socket welded except where shown on drawings or required for equipment connection.
- B. Pipe Fittings: Buttweld elbows, tees, and reducers shall be seamless, ASTM A234, grade WPB, schedule shall match adjacent piping. Buttweld elbows shall be long radius. Schedule to match pipe wall. Socketweld and threaded fittings shall be ASTM A105, 3000#.
- a. Pipe and fittings 1-1/2" and larger shall be full penetration butt welded. Flanged fittings shall be ANSI 150 lbs, raised face, weld neck, ASTM A105, bore to match adjacent pipe
 - b. Pipe and fittings smaller than 1-1/2" shall be socket welded. Flanged fittings shall be ANSI 150 lbs, raised face, socketweld, ASTM A105, bore to match adjacent pipe
 - c. Provide flanged connections as required to allow removal of individual components. Threaded fittings are not allowed except where shown on the project drawings, or required for connection to equipment.

2.3 PIPING SPECIALTIES

- A. Exterior Piping Specialties:
1. Flange Gaskets: Gaskets shall be raised face, spiral wound, with stainless steel winding strip, flexible graphite filler, with carbon steel inner and outer rings, and rated for -50°F service.
 2. Ball Valves 1-1/2" and larger: Full port, ANSI class 150 lbs., Cast carbon steel body, stainless steel ball, Teflon seat and stuffing box seals, lockable lever handle, raised faced flanged. All materials shall be suitable for the service conditions. NACE MR-01-75 Conformance and fire safe per API 607. PBV C-5410-31-2236-FTNL, or approved equal.
 3. Ball Valves less than 1-1/2"
 - a. 29,000 gallon Bulk Fuel Tank Water Draw Valves - ANSI class 300 lbs., cast carbon steel body, stainless steel ball, Teflon seat and stuffing box seals, lockable lever handle. All materials shall be

suitable for the service conditions.

- b. All Others - ANSI class 150 lbs., cast carbon steel body, stainless steel ball, Teflon seat and stuffing box seals, lockable lever handle. All materials shall be suitable for the service conditions. Nibco Model No. T-590-CS-R-66-FS-LL, or approved equal.
4. Check Valves: Carbon steel, ANSI class 150 lbs., raised face flanged, swing check valve. Crane No. 147, or approved equal. Smaller than 2", Bonney Forge L1-61 piston check valve or equal.
5. Wye Strainer: Flanged, carbon steel body, bottom clean-out "Y"-strainer with 1/16" perf. mesh, and blow off tapping plug. Mueller Fig. 781, or approved equal. Provide blow off tapping with lockable ball valve and threaded plug for blow down.
6. Basket Strainer: Flanged, carbon steel body, bottom clean out, bolted top cover, basket with 1/4" perf. mesh, and blow off tapping plug. Mueller Fig. 185 or approved equal. Provide blow off tapping with lockable ball valve and threaded plug for blow down.
7. Flex Fittings: ANSI Class 150 lbs., stainless steel annular corrugated inner core with stainless steel braided cover, fixed flanged end by floating flanged end with 18" live length or as specified otherwise on project drawings or required for equipment connection. Pressure test at 110 psi and provide certification for each flex. Metraflex Metra-Mini, or approved equal.
8. Pressure Relief Valves: For thermal expansion relief, raised face flanged, carbon steel body pressure relief valve set as specified on drawings. PSV's shall be Hydro-seal Model No. 30FL1CV-00 for 2" and 1FLAXV-00 for 1", and relief pressure set as indicated on project drawings, or equal.
9. Anti-Siphon Valve: Normally closed, stainless steel body, with special expansion relief set at 25 psi. Valve set to open at 20 feet head pressure. Morrison Bros Figure 910ER, or approved equal.
10. Actuated Ball Valves: Normally Closed, ANSI class 150 lbs, A350LF2 body, buna seats and seals. 350 in-lbs operating torque at -50°F, PTC self-regulating heater, NEMA 7 enclosure without manual override shaft extension, Exxon Beacon 325 severe cold grease, 115 V AC, 600 in-lbs torque: 10 second stroke time, stainless steel mounting hardware to allow for manual operation using #10 adjustable wrench, actuator rated to -50°F. 2" ball valve shall be Nutron model#T3-R20R01LZ with RCS model SXR-1023 actuator, no substitutes.
11. Pressure Switches: Adjustable differential pressure switch for NEC class I division I group D areas. Adjustable operating range 0.2 to 10 psig, 100 psig maximum operating temperature. Manufacturer: Square D, class 9012, type GAR1. Install to measure gage pressure at transfer pump discharges.
12. Fuel Flow Switches (at hose reel enclosures): See Electrical Design Drawings.

13. Quick Connect Couplings: Aluminum body cam and groove fitting with dust cap. Male fitting with ANSI 150-pound class flanged MPT or FPT connection, as shown, 150 psig minimum working pressure. PT Coupling or approved equal.
14. Cam Lock Couplings: Aluminum body cam and groove male fittings with FNTF connection, 150 psi minimum working pressure. Provide dust cap with Buna-N seal for each fitting provided. PT couplings or equal.
15. Dry break coupling: Aluminum body cam and groove fitting with dust cap with ANSI 150-pound class flanged, MPT, or FPT connection as shown on the Contract Drawings. 150 psig minimum working pressure. Each dry break coupling to include dust caps and appropriate adapters to connect to standard camlock fittings of the same size. PT Coupling Maxi-Dry Series MD20A or approved equal.
16. Strainers: Flanged, carbon steel body, bottom clean-out Y-strainer with #10 mesh and blow-off tapping plug. Mueller Fig. 781, or approved equal.
17. Utility Markers: Continuous glass fiber and resin reinforced marker, one-piece, vandal and vehicle impact resistant. Provide Carsonite CUM 375 or approved equal.

2.4 PIPE SUPPORTS

- A. All pipe supports, clamps, fittings, and hardware shall be Stainless Steel.
- B. Support strut: Stainless Steel finish and slotted back unless specifically indicated otherwise.
 1. Standard strut: 12 gauge, 1-5/8 inch by 1-5/8 inch, Unistrut P1000T (SS), or approved equal.
 2. Double strut: 12 gauge, 1-5/8 inch by 3-1/4 inch, Unistrut P1001 (SS), or approved equal.
 3. Post Base: 1-5/8 inch by 1-5/8 inch, Unistrut P1887 (SS), or approved equal.
 4. Single Strut: 12 gauge, 1-5/8 inch by 1-3/8 inch, Unistrut P3000 (SS), or approved equal.
 5. Deep Strut: 12 gauge, 3-1/4 inch by 1-5/8 inch, Unistrut P5000 (SS), or approved equal.
 6. Shallow strut: 14 gauge, 1-5/8 inch by 13/16 inch, Unistrut P4100T (SS) or approved equal.
 7. Solid back strut: For welding to tanks or structures, 12 gauge, 1-5/8 inch by 1-5/8 inch, unfinished black steel, Unistrut P1000 (SS), or approved equal.
- C. Provide stainless steel fitting, brackets, channel nuts and accessories designed specifically for use with supplied strut.

- D. Pipe Clamps: stainless steel two-piece pipe clamp designed to support pipe tight to strut. Unistrut P1117E-SS and P1119E-SS or approved equals.
- E. Pipe Straps: stainless steel two-hole pipe strap. Unistrut P2558 (SS), no substitutes.
- F. Fasteners:
 - 1. Bolts, nuts and washers: Stainless steel unless galvanized is specifically shown. Stainless steel shall be: Type 316L.
 - 2. Lags: stainless steel unless galvanized steel is specifically shown. Stainless steel shall be: Type 316L.

2.5 PIPE AND PIPE SUPPORT COATINGS

- A. Coating processes shall be submitted to the engineer for approval prior to pipe coating.
- B. Above Grade Steel Pipe:
 - 1. Prime pipe and fittings prior to shipping from factory. Prepare outer pipe and fitting surfaces by wheel abrading or sandblasting to bare metal. Prime with universal red oxide primer (Devoe Rustguard 4160 OAE) to 1.5 mils minimum DFT.
 - 2. After field fabrication is complete, top coat primed pipe and fittings with two coats of ALKYD enamel (Devoe Gloss Industrial 4308 OAE). Color shall be red (ICI Color Code 9000 – Safety Red) for gasoline piping and green (ICI Color Code 6650 – Medium Green) for diesel piping for gasoline piping.
 - 3. Label all above grade piping as to contents and provide flow direction arrows in accordance with ASME A13.1. Arrows may be painted stencils or high quality printed stickers. Maximum flow direction arrow spacing shall be 10 feet measured along pipe length, minimum of one arrow per pipe segment. Color shall be black. Periodically label each pipe run every 50-feet.

2.6 FUEL DISPENSERS, APPURTENANCES, & POS SYSTEM

- A. Dual Product Dispenser: Dual Product Dispenser shall be UL listed electronic, two hose, dual product (gasoline/diesel), single sided, dispenser. Dispenser shall be certifiable for retail fuel sales. Gasboy Atlas 8853 electronic dispenser, no substitutes.
 - 1. Contractor shall provide a certified specialist for final installation, wiring, and commissioning of the dispenser, card reader, wireless antenna & POS system to ensure a complete and operational system.
- B. Dispenser Appurtenances:
 - 1. Retail Dispensing Facility Arctic Hose: Low temperature (-60 deg F) ¾ inch fuel dispensing hose, 300 psi working pressure, Goodyear Arctic Ortac, or approved equal. Provide hose swivels at each end.

2. Retail Dispensing Facility Breakaway Coupling: UL listed, $\frac{3}{4}$ inch, breakaway fitting, EBW model# 679-137 with hose connection, or approved equal.
 3. Retail Dispensing Shear Valve: 1-1/2" x 1-1/2" shear valve with fusible link. Morrison Bros. Co. model# 636F, or approved equal.
 4. Retail Dispensing Facility Hose Swivel: UL listed dispenser hose swivel. OPW model# 45M-0492, or approved equal.
 5. Retail Dispensing Hose Nozzle: UL listed, automatic shut-off, automotive fill nozzle with hold open rack and color coded handles (black for gasoline, green for diesel). OPW model#11BP-0400 and 11B-0100, or approved equal.
- C. Coatings: Dispenser structure, floor, and base shall be coated in accordance with 05 50 00. Bolts, nuts, and washers shall be hot dip galvanized in accordance with ASTM A153.
- D. Island Card Reader System at Dispenser Enclosure: Install FuelMaster Smart Card Credit Card Reader system to interface with specified electronic dispenser and POS system. Fuelmaster card reader system shall interface wirelessly with POS system. All card reader components shall be FuelMaster and installed per manufacturer's recommendations:
1. FuelMaster Electronic Dispenser Interface Kit.
 2. FuelMaster Credit Card Reader Master Unit. Master unit must be enclosed, pedestal mounted, adjacent to retail dispenser as shown in the contract drawings.
 3. FuelMaster Wireless FMU Mount Directional Antennas. Install antennas at the locations shown in contract drawings.
- E. Point of Sale System: Install POS System at location shown in the contract drawings. POS system shall be for fuel sales at the old clinic building located 850-feet west of the dispenser at old clinic building Install point of sale system components per manufacturer's recommendations. POS shall interface with fuel site card reader and electronic dispenser specified above:
1. FuelMaster Wireless Directional Antennas
 2. FuelMaster Plus Windows Software (SLQ & Server access).
 3. POS FuelMaster Hardware, and uninterruptible power supply (UPS).
 4. FuelMaster PIN pad and Receipt stand.
 5. FuelMaster or approved equal FuelMaster compatible cash drawer. Contractor shall submit cash drawer product for Engineer's approval

prior to construction.

6. All required hardware, software, and materials for a complete and operable fuel sales and dispensing system.
- F. Contractor shall provide a certified specialist for final installation, wiring, and commissioning of the dispenser, card reader, wireless antenna & POS system to ensure a complete and operational system.

2.7 BULK FUEL TRANSFER EQUIPMENT

- A. Meters: Positive displacement meter rated for 100 gpm of continuous flow with a 150 psig working pressure. Accuracy shall be +/- 0.22% or better from 6-60 gpm. Provide 2-inch inlet and outlet companion flanges with o-ring seals, preset counter with direct mechanical linkage to shutoff valve, resettable register, non-resettable totalizer, air eliminator, strainer, microswitch for shutting down transfer pump, and 10 gallon dwell. All elastomeric seals shall be low temperature nitrile rubber (Buna-N). Factory calibrate for No. 1 diesel fuel, or unleaded gasoline as indicated.
1. Resettable registers shall have 0.1 gallon as the smallest division, preset counter with whole gallon increments only.
 2. Liquid Controls M-7-K-1 or approved equal.
- B. Fuel Filter: Two (2) cartridge in-line filter with Buna-N gasket and grommets, 1 ½" NPT inlet/outlet, 50 psig maximum working pressure 60 GPM capacity. CIM-TEK Centurion III or approved equal. Provide eight (8) Buna-N gaskets (#90005), eight (8) 30 micron hydro sorb type II (#30036), eight (8) Buna-N grommets (#90006), eight (8) filter cartridges (#90002), and two (2) replacement canisters.
- C. Bulk Transfer Arctic Hose: 1 ½ inch diameter with 1 ½ inch NPT connections at each end. Provide 30 foot long section of hose with each hose reel assembly. Goodyear Arctic Ortac or approved equal.
- E. Bulk Transfer Breakaway Connection: UL listed 1 1/2-inch breakaway fitting. OPW model no. 66SP-5150 with custom fabricated 18-inch hose section, 1 ½" NPT connections at each end.
- F. Hose Swivel: UL listed hose swivel. PT Coupling model F0B150MF, or approved equal.
- G. Hose Nozzle: UL listed automatic shut off, heavy duty, high flow fill nozzle with hold open latch and color coded handle, green for diesel #1 and #2 and red for gasoline. OPW 1290-0050, or approved equal.
- H. Hose Reel: Class 1, Div 1 rated, spring rewind hose reel capable of holding 40 feet of 1 ½ inch I.D. hose. Hannay 920-25-26A with utility hose rollers and ball stop for 1 ½ arctic hose, or approved equal.
- I. Static Grounding Reel: Enamel coated steel frame and reel with permanently sealed spring return. Provide with 50 feet of 1/8 inch galvanized carbon steel cable,

minimum 100 ampere grounding clip, and stop ball. Hannay GR75, or approved equal.

- J. Cam Lock Couplings: Aluminum body cam and groove male fitting with FNPT connection, 150 psig minimum working pressure. Provide dust cap with Buna-N seal for each fitting provided. PT coupling, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING AND FITTINGS

- A. General Provisions:
 - 1. Work includes all tank farm piping and distribution piping to and from marine or truck fill headers, bulk storage tanks, and bulk transfer hose reels.
 - 2. All piping shall be fabricated and tested in conformance with ASME/ANSI B31.4.
 - 3. Diagrams: Piping diagrams are schematic only and must not be used for obtaining lineal runs or number and type of fittings.
 - 4. Offsets in Piping: The drawings do not attempt to show exact details of all piping. No extra payments will be allowed where obstructions in the work of other trades, or work under this contract, require offsets in piping.
 - 5. Openings in Pipes: Keep closed during the progress of the work.
 - 6. Installation of Valves: Install valves with stem horizontal or above the horizontal.
 - 7. Connections to Equipment: All piping connections to motor driven equipment shall be made through flexible pipe connectors.
 - 8. Short Pipe Connections: Close nipples are not permitted. For short pipe connections, use standard short nipples.
 - 9. Make threaded joints using pipe joint compound applied to the male threads. Hercules Grip, no substitution.
 - 10. Coat flange gaskets with anti-seize compound prior to assembly.
 - 11. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
 - 12. Flanged Connections: Make up joints with flanged faces true and perpendicular to the centerline of the pipe to which the flanges are attached. Bolts for flanged joints shall be steel square head machine bolts with heavy semi-finished hexagon nuts.

13. Flanges: Wherever welded piping connections to equipment, valves, or other units need maintenance, servicing or require possible removal, the connecting joint shall be flanged. Pressure rating of the pipe flanges shall match the pressure rating of the flanges on the equipment to which the piping connects.
14. Route piping in an orderly manner and maintain gradient
15. Group piping whenever practical at common elevations.
16. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment. Install valves to allow full operation without obstruction of operating handle.
17. Support piping and equipment as shown on the drawings using specified supports and fasteners. If not detailed on the drawings, support from structural members with pipe hangers, clamps or pipe straps specifically intended for the application. Do not support piping from connections to equipment. Provide piping supports spaced per the following table.

<u>Pipe Size</u>	<u>Maximum Support Spacing</u>
1-1/2 inch	9 ft
2 inch	10 ft
2-1/2 inch	11 ft
3 inch	12 ft
4 inch	14 ft

18. Provide piping supports as shown and as required to adequately support piping. Touch up all cut ends and damaged surfaces of galvanized steel and zinc plated supports and fasteners with spray-on cold galvanizing compound. ZRC, or approved equal.
 19. Do not use stainless steel in contact with galvanized supports.
 20. Label contents of all piping in accordance with ASTM A13.1
- B. Perform welding in accordance with ASME BPV, IX and API 1104. Welding procedures shall be submitted and approved. Visually inspect weld joints in accordance with API 1104. Welder shall be certified for the approved procedure and welder certification shall be submitted and approved.

3.2 INSTALLATION OF PIPING SPECIALTIES

- A. Install per manufacturer's recommendations.

3.3 UTILITY MARKERS

- A. Install utility markers every 50 feet along the pipeline outside diked areas.
- B. Utility markers shall not be installed on drivable surfaces of trails or roads. Markers shall be clearly visible and out of the way of vehicles and pedestrians.

3.4 PRESSURE TESTING

- A. Pressure Testing for Exterior Fuel Piping: Piping shall be pressure tested per ASME B31.4.
 - 1. Notify PROJECT MANAGER in writing seven (7) days in advance of pressure tests. PROJECT MANAGER shall be present at all testing. Pressure testing performed without PROJECT MANAGER present will be rejected, unless prior written approval is received from PROJECT MANAGER.
 - 2. Pressure test requirements for above ground pipe:
 - a. Piping shall be tested prior to the application of coatings and the installation of valves, strainers, etc. Pressure test piping spools at 125 psi for a minimum of 1 hour or longer as required to visibly inspect all joints in the tested section for leaks.
 - b. After all piping, valves, and other equipment are installed a final pneumatic leak test shall be performed. Piping shall be pressure tested at 1.5 times the operating pressure or a minimum of 125 psi, whichever is greater, for a minimum of 4 hours. All joints shall be inspected for leaks.
 - c. Provide a minimum 4-inch diameter calibrated clock gauge with readings in 1 psi increments for pressure observation.
- B. Pressure Test Documentation: Provide test reports for all pressure tests required above. Submit a copy of each test report to the owner for approval prior to covering pipe. All test reports shall include the following.
 - 1. Date of Test.
 - 2. Identification of piping system tested.
 - 3. Test fluid.
 - 4. Test duration.
 - 5. Test pressure, ambient temperature, and time at start and finish.
 - 6. Certification of test equipment.
 - 7. Certification results by examiner.
- C. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated and serviced in accordance with factory instructions.

3.5 FUEL SYSTEM TESTS

- A. The entire fuel system shall be tested for leaks IAW 3.4.A.2 above after installation and prior to operational testing of pumps, motor operated valves, fuel transfer control panels, etc.
- B. The CONTRACTOR shall perform operational testing of the entire fuel system to include but not limited to all pumps, motor operated valves, fill limiting valves, level switches, pressure switches, dispensing units, fuel transfer control panels, fuel dispensing controllers, cathodic protection systems, etc..

END OF SECTION

SECTION 33 52 23
BULK FUEL TRANFER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Follow all provisions of Section 33 05 00, "Common Work Results for Utilities."

1.2 WORK INCLUDED

- A. Work under this section shall include furnishing all labor, materials, tools, and equipment necessary for the complete installation of the pump system.

1.3 SUBMITTALS

- A. Submit each item specified in this Section according to the Conditions of the Contract and Division 01 Specification Sections and Section 33 05 00, "Common Work Results for Utilities".
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- C. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- D. Manufacturer's Installation Instructions: Indicate rigging, assembly, and installation instructions.

1.4 QUALITY ASSURANCE

- A. Pumps procured from sources beyond territorial boundaries of the United States (including Alaska and Hawaii) will not be acceptable.
- B. The installing contractors shall have the necessary knowledge, skills and equipment to enable proper and safe pump installation.
- C. Storage: Protect pumps from dirt and moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements. Manufacturers offering products that may be incorporated in the work include, but are not limited to the following:

1. Pumps:
 - a. Gorman-Rupp.
 - b. Red Jacket.
 - c. STP.

2.2 PUMPS

- A. Submersible Pumps: 3/4 hp, 208-230v, single phase, explosion proof submersible turbine pump with intake screen and integral leak detection. Install pump intake to level shown on drawings. Provide Red Jacket NO. P75S1 with trapper intake screen, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Check equipment for damage that may have occurred during shipment. Repair damaged equipment as approved or replace with new equipment.

3.2 INSTALLATION

- A. Install pumps and associated equipment in accordance with applicable codes and per manufacturer's installation instructions.
- B. Electrical installation shall be in accordance with NEC and Division 26 Specifications.

3.3 FUEL SYSTEM TESTS

- A. The entire fuel system shall be tested for leaks IAW 33 52 13 – *Liquid Fuel Piping* after installation and prior to operational testing of pumps, motor operated valves, fuel transfer control panels, etc.
- B. The Contractor shall perform operational testing of the entire fuel system to include but not limited to all pumps, motor operated valves, fill limiting valves, level switches, pressure switches, dispensing units, fuel transfer control panels, fuel dispensing controllers, cathodic protection systems, etc.

END OF SECTION

SECTION 33 56 13 ABOVE GROUND FUEL STORAGE TANKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Follow all provisions of Section 33 05 00, "Common Work Results for Utilities".
- C. See project drawings and Section 01 64 00, "Receipt of Owner Furnished Materials" for tank quantities and locations.
- D. OWNER provided tank shop drawings are available upon request.

1.2 WORK INCLUDED

- A. This Section includes the furnishing of all labor, tools, equipment, and materials necessary to package for shipment, deliver, and install:
 - 1. One (1) **OWNER PROVIDED**, Contractor shipped and installed, eleven thousand six hundred (11,600) gallon, double wall, UL 2085 protected, dual compartment, horizontal, steel, skid mounted, aboveground storage tank for diesel and gasoline service- See Tank Shop Drawings.
- B. Authority Provided Tanks are NOT equipped with fittings and appurtenances other than those included in the tank Shop Drawings. Contractor to provide and install all required components for a functioning code compliant system. **Authority provided tanks are to be shipped to the jobsite by Contractor. Tank locations are provided in Section 01 11 13.**
- D. ALL TANK APPURTANCES for OWNER provided tanks.

1.3 SUBMITTALS

- A. Submit each item specified in this Section according to the Conditions of the Contract and Division 01 Specification Sections and Section 33 05 00, "Common Work Results for Utilities".
- B. Submit shop drawings for the following components:
 - 1. Submittals shall include all tank appurtenances including but not limited to pumps, tank liquid level indicators, normal/emergency vents, sample hatches, overfill prevention valves, high/low level alarms, pump control panel, etc.

2. Submit material lists with catalog cuts for any proposed substitutions.
3. Quality Control Plan.

1.4 REFERENCED STANDARDS

- A. American National Standards Institute (ANSI):
 1. B1.20.1, Pipe Threads, General Purpose (Inch).
- B. American Society for Testing Materials (ASTM):
 1. A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 2. A105, Specification for Forgings, Carbon Steel, for Piping Components.
 3. A106, Standard for Seamless Carbon Steel Pipe.
 4. A181, Forgings, Carbon Steel, for General Purpose Piping.
 5. A183, Carbon Steel Track Bolts and Nuts.
 6. A234, Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- C. American Society of Mechanical Engineers (ASME):
 1. ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
 2. ASME B31.9, Building Services Piping.
 3. B16.3, Malleable-Iron Threaded Fittings.
 4. B16.5, Pipe Flanges and Flanged Fittings.
 5. B16.34, Valves—Flanges, Threaded, and Welding End.
 6. B16.39, Pipe Unions, Malleable Iron Threaded.
- D. Underwriters Laboratories (UL):
 1. UL 142, Steel Aboveground Storage Tank Installation & Testing.
 2. UL 2085, Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids
- E. National Fire Protection Association (NFPA):
 1. NFPA 30/30A Flammable and Combustible Liquids Code.

2. NFPA 31, Standard for the Installation of Oil Burning Equipment.

1.5 QUALITY ASSURANCE

- A. Piping, fittings, and valves manufactured or procured from sources beyond territorial boundaries of the United States will not be acceptable.
- B. The installing CONTRACTORS shall have the necessary knowledge, skills and equipment to enable proper and safe above ground storage tank installation.
- C. Tank Handling: To prevent damage to the tank, equipment to handle the vessel shall be of adequate size to lift and lower the tank without dropping or dragging.
- D. Tank Storage: If the tank must be temporarily stored prior to installation, it shall be placed in an area away from activity where tank damage could occur. Factory-installed protective padding material should remain in place until the tank is ready to be lowered in the excavation.
- E. Comply with all applicable city and state codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances shall govern.
- F. Tank manufacturers shall have a minimum of 10 years experience including the manufacture of at least five similar tanks in the previous three years.
- G. Tank Leak Test: Provide tank integrity testing in the form of a hydrostatic test or other approved method in accordance with UL 142.

1.6 DRAWINGS

- A. Contract Drawings are diagrammatic and show the general design, arrangement, and extent of the facility. Due to the small scale of the drawings it is not possible to show all offsets, fittings, and accessories which may be required. CONTRACTOR shall carefully investigate the field conditions and work requirements for all trades and arrange accordingly.
- B. CONTRACTOR is responsible for verifying drawing dimensions by making field measurements and preparing separate shop drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials and apparatus shall be new unless otherwise specified, and each shall have all necessary accessories to make it functionally complete. All items of the same type shall be of the same manufacturer.
- B. Tank manufacturer to provide shop-welded standoffs as required for bolting on appurtenances in the field.
- C. **FIELD WELDING TO TANKS IS PROHIBITED.**

2.2 11,600 GALLON PROTECTED TWO PRODUCT DISPENSING TANK

- A. The 11,600 gallon tank is **OWNER PROVIDED** and CONTRACTOR shipped and installed. See Specification Section "Owner Furnished Materials" for tank location. All tank appurtenances shall be provided by the CONTRACTOR and installed in the field.
- B. Tank Appurtenances for 11,600 Gallon Tank:
1. Provide all tank appurtenances as required by applicable codes. Appurtenances shall include fill tubes & internal piping.
 2. Labeling: Provide labeling on tank in accordance with the International Fire Code and NFPA 704, including but not limited to product identification, hazard identification, tank numbering, compartment storage capacity, etc.
 3. Provide atmospheric and emergency venting for the storage tank in accordance with UL 142.
 - a. Primary Tank Combination Atmospheric Vent/Alarm: Threaded 3" pressure/vacuum vent with integral whistle overfill alarm set to activate at 6 oz/sq. inch pressure. Provide Morrison Bros., Co Fig 922, or approved equal. Set whistle to start at 90% of tank capacity.
 - b. Emergency Vents: Aluminum body, flanged connection emergency vent set to open at 16 oz/sq. inch pressure. Emergency vent shall be sized in accordance with UL142. Morrison Bros, Co. Model 244F, with flanged adapter, or approved equal. Loose manholes not permitted.
 4. Liquid Level Clock Gauges: Stainless Steel float operated clock gauge with readout in feet and inches, up to 12 feet in ¼" increments installed in stilling well. Morrison Bros, Co. Model No. 818, or approved equal.
 5. Gauge Hatch: Brass cap, brass adapter, and brass chain, Buna-N gasket, 2-inch FPT connection. Morrison Figure 307, or approved equal.
 6. Submersible Pump: See section "33 52 23 Liquid Fuel Pumps".
 7. Fill drop tube, 3-inch shop fabricated.
 8. Tank mounted spill container, 4-inch, offset, w/drain & camloc coupling, Morison Bros Fig 516, OAE.
 9. See project drawings for further specifications and requirements.

2.3 COATING SYSTEMS

- A. Tanks and Appurtenances

1. All ladders, ladder cages, catwalks and railings shall be hot dipped galvanized in accordance with ASTM A123, G90.
2. The tank exterior, saddles, skids, fittings, nozzles, and standoff supports shall be shop coated in accordance with the following specification and in accordance with the coating manufacturer's recommendations.
 - a. Surfaces to be coated: All exterior surfaces of tanks, including bottom of vertical tanks, nozzles, skids, pipe supports, fittings, pipe and interior and exterior surfaces of hose reel cabinet.
 - b. Surfaces not coated: Flange and nozzle faces, penetration threads, flange and manhole bolts.
 - c. Coatings:
 - i. Prime Coat- Devoe Catha-Coat 302H (3 mils minimum dry finish thickness (DFT))
 - ii. Intermediate Coat – Devoe Bar-Rust 236 (5-6 mils minimum DFT)
 - iii. Top Coat- Devoe Devthane 389 (2-3 mils DFT)
 - d. Coat Colors: All coats shall be contrasting colors. Top coat color shall be white.
 - e. Where field touch up of paint is required, wire brush area to bare metal and paint with prime, intermediate and top coats as indicated above.
 - f. Touch-up Paint: Provide 5 gallons each (15 gallons total) of prime, intermediate, and top coat coatings. The touch-up coating shall be color matched to coatings applied to the tanks.

PART 3 - EXECUTION

3.1 INSTALLATION OF ABOVEGROUND TANK

- A. General: Comply with current edition of Steel Tank Institute Standard No. R912 and R931, Contract Drawings and manufacturers written instructions.
- B. Site Preparation: Site shall be properly graded to provide drainage of surface water and prevent stagnant water under or around the tank.
- C. The tank shell shall be maximum 12-inches above finished grade. Infill between tank foundation elements with classified fill as required.
- D. Testing: Before placing tank in service, conduct on-site air pressure tests on both the inner tank and the secondary containment in accordance with UL 142 or approved test method.
- E. Touch up painting: After final placement and setting of tank, and after all connections to/from the tank and all appurtenances have been installed, tank paint is to be touched up using the touch up paint provided by the manufacturer or as indicated under tank coatings requirements in this section.

- F. Tank shall be electrically grounded.

END OF SECTION

SECTION 33 71 16

UTILITY POLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood poles.
 - 2. Pole hardware.
- B. Related Sections:
 - 1. Section 26 56 00 – Exterior Lighting

1.2 SCOPE

- A. Provide primary, secondary, and lighting poles as shown on plans. Light fixtures are not permitted on secondary poles.
- B. Verify pole size and quantities with AEA prior to procurement.
- C. Coordinate all pole locations with AEA prior to erecting.

1.3 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C135.30 - Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction.
 - 2. ANSI C135.4 - Zinc-Coated Ferrous Eyebolts and Nuts for Overhead Line Construction.
 - 3. ANSI C135.5 - Zinc-Coated Ferrous Eyunuts and Eyebolts for Overhead Line Construction.
 - 4. ANSI C135.6 - Zinc-Coated Ferrous Crossarm Braces for Overhead Line Construction.
 - 5. ANSI O5.1 - Wood Poles, Specifications and Dimensions.
- B. ASTM International:
 - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A475 - Standard Specification for Zinc-Coated Steel Wire Strand.
- C. American Wood-Preservers' Association:

1. AWWA C4 - Poles - Preservative Treatment by Pressure Processes.
 2. AWWA U1 - Use Category System: User Specification for Treated Wood.
- D. Institute of Electrical and Electronics Engineers:
1. IEEE C2 - National Electrical Safety Code.
 2. IEEE C135.1 - Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction.
 3. IEEE C135.2 - Standard for Threaded Zinc-Coated Ferrous Strand-Eye Anchor Rods and Nuts for Overhead Line Construction.

1.4 SUBMITTALS

- A. Submit each item specified in this Section according to the Conditions of the Contract and Division 01 Specification Sections and Section 33 05 00, "Common Work Results for Utilities".
- B. Shop Drawings: Indicate pole locations, quantities of each type, and details of pole guy construction.
- C. Product Data: Submit data showing materials and construction of hardware.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of poles, guys, anchors, and required horizontal and vertical clearances.
- B. Operation and Maintenance Data: Submittals for Project Closeout.

1.6 QUALITY ASSURANCE

- A. All construction work shall be done in a thorough and workman-like manner in accordance with the staking sheets, plans and specifications, and the construction drawings.
- B. The latest edition of the National Electrical Safety Code (NESC, ANSI C2) shall be followed except where local regulations are more stringent, in which case local regulations shall govern.
- C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 13– Material and Equipment: Requirements for transporting, handling, storing, and protecting products.
- B. Protect poles from damage and decay by stacking to allow free circulation of air. Maintain 1 foot minimum spacing between bottom pole and ground or ground vegetation. Do not store poles above decayed or decaying wood.
- C. Stack poles stored for more than two weeks on creosoted or decay-resistant skids arranged to support poles without noticeable pole distortion.
- D. Handle treated poles with tools to not produce indentations greater than 1 inch deep. Do not drag treated poles along ground. Do not apply tools to section of treated poles between 1 foot above and 2 feet below ground line.

PART 2 PRODUCTS

2.1 POLES

- A. Wood Poles: ANSI O5.1, treated Douglas Fir poles of minimum length and class indicated.
- B. Select poles for straightness and minimum sweeps and short crooks.
- C. All utility poles are to be pressure treated with Penta to a minimum of .45# CF by Assay per RUS Specifications #1728F-700, Specification #1728H-702, and Pole Framing Guide W1.1G (M20).
- D. Vendor will be required to supply Certification of Inspection with each purchase order.
- E. All utility poles are to be banded.
- F. Poles should be marked according to the RUS Pole Framing Guide W1.1G (M20) and include the supplier's code or trademark; independent inspection agency designation or quality assurance mark; plant location and month and year of treatment; code letters denoting the pole species, preservative and required retention; height and class of the pole, and "AEA". The letters shall be not less than 5/8-inch high if burn branded, and not less than 1/8-inch high if on a metal tag.

2.2 POLE HARDWARE

- A. Miscellaneous Pole Hardware: Hot-dipped galvanized after fabrication.
- B. Ground Rods: ANSI C135.30.

- C. Ground Wire: Soft drawn copper conductors, 6 AWG minimum size.

PART 3 EXECUTION

3.1 PREPARATION

- A. Plug unused holes in poles using treated wood dowel pins. Treat field-cut gains and field-bored holes with preservative.
- B. Cut gains on face of pole, with gained surfaces in parallel planes.
- C. Shorten poles when required by cutting from top end. Apply hot preservative to shortened end of pole.

3.2 INSTALLATION

- A. Pole setting:
 - 1. All poles shall be set to REA/RUS specifications plus one foot. The minimum depth for setting poles shall be as follows:

Length of Pole (feet)	Setting in Soil (feet)
20	4.0 + 1.0 = 5.0
25	5.0 + 1.0 = 6.0
30	5.5 + 1.0 = 6.5
35	6.0 + 1.0 = 7.0
40	6.0 + 1.0 = 7.0
45	6.5 + 1.0 = 7.5
50	7.0 + 1.0 = 8.0

On sloping ground, the depth of the hole shall be measured from the low side of the hole.

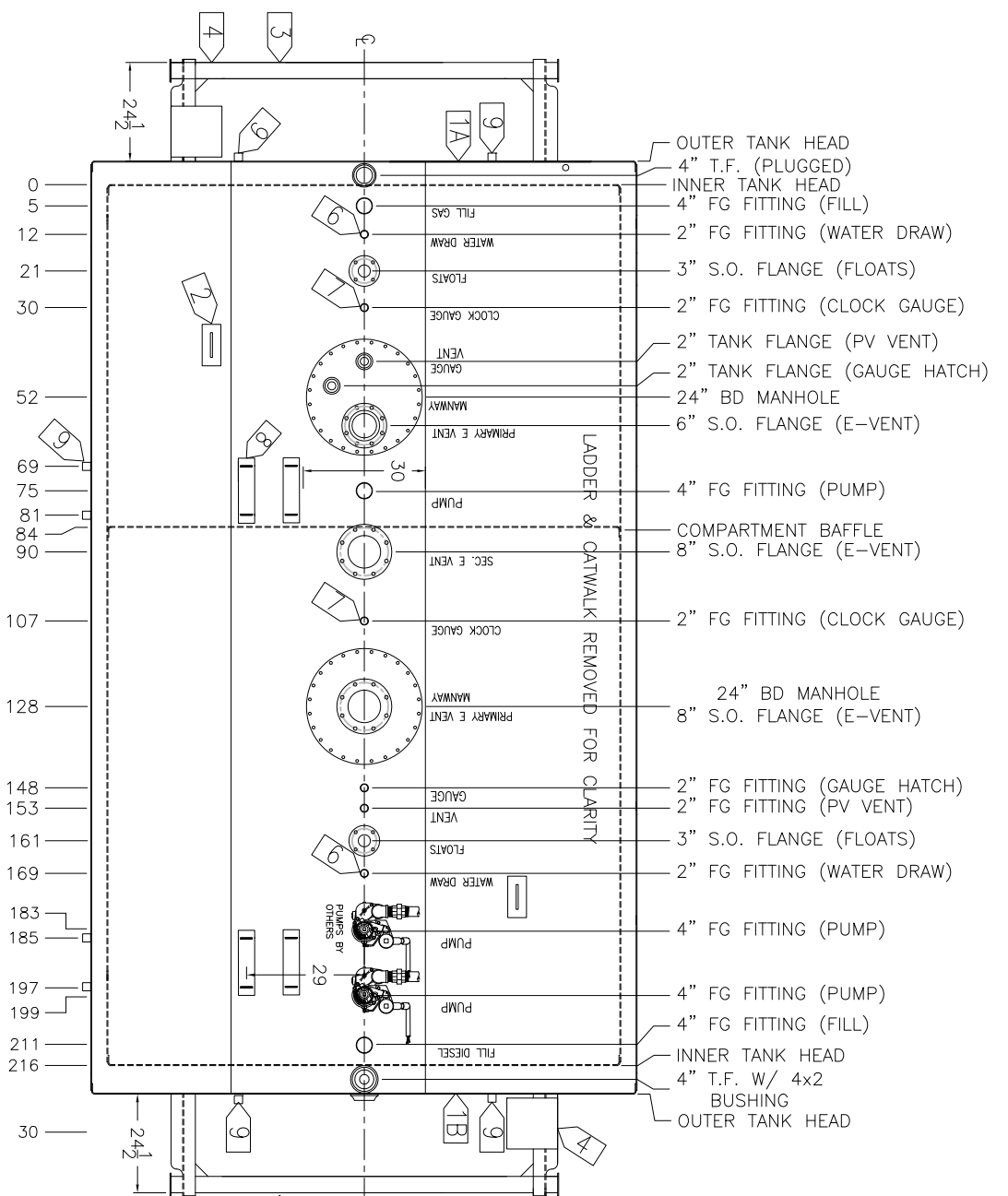
- B. Utility Pole setting:
 - 1. All poles shall be set to REA/RUS specifications..
 - 2. Poles shall be set in alignment and plumb except at corners, terminals, angles, junctions, or other points of strain, where they shall be set and raked against the strain so that the conductors shall be in line..
 - 3. Pole backfill shall be thoroughly tamped the full depth. Excess dirt shall be banked around the pole.
- C. Lighting Pole setting
 - 1. All poles shall be set to REA/RUS specifications..
 - 2. Poles shall be set per plans. .
 - 3. Pole backfill shall be thoroughly tamped the full depth. Excess dirt shall be banked around the pole.

- D. Grading of line:
 - 1. When using high poles to clear obstacles such as buildings, foreign wire crossing, railroads, etc., there shall be no up-strain on pin-type (*) insulators in grading the line each way to lower poles.
- E. Dig setting holes large enough to permit use of tampers to full depth.
- F. Set poles in straight line or as shown on the plans. Place curved poles with curvature in line with lead pole. Maintain even grade.
- G. Set poles plumb. Rake poles located at corners, angles, and dead ends so poles are plumb after line installation.
- H. Do not install poles along edge of cuts and embankments or where soil is in danger of washing out.
- I. Install ground rods and ground wire. Per RUS Guide drawing

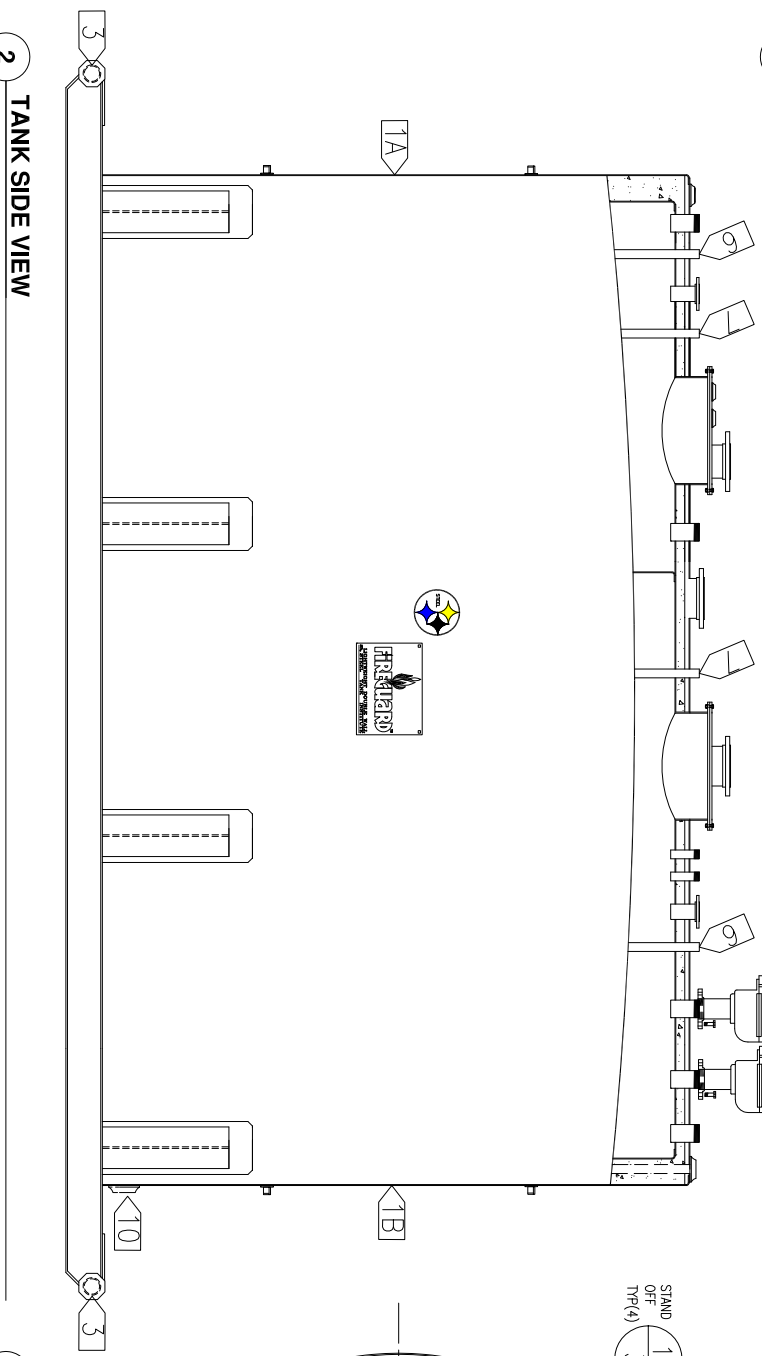
3.3 FIELD QUALITY CONTROL

- A. Field test at least one anchor of each capacity installed to rated holding power.

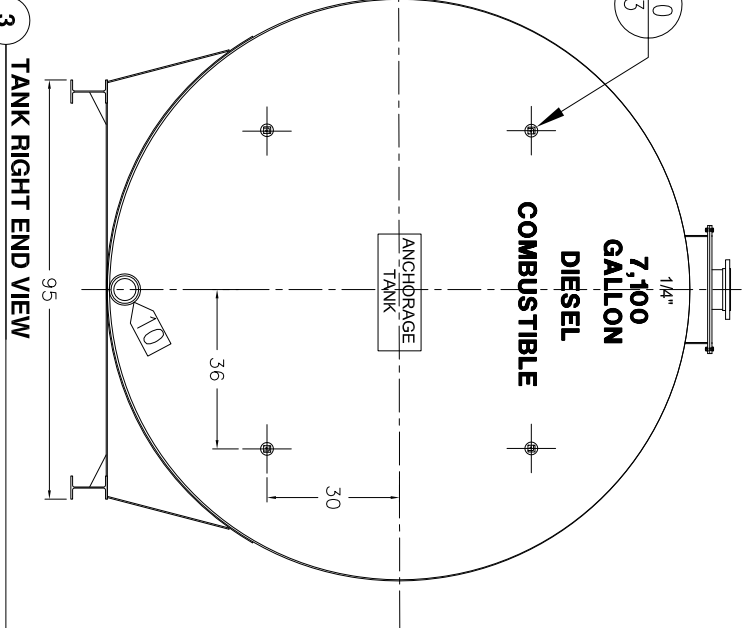
END OF SECTION



1 TANK TOP VIEW - FITTING LAYOUT
SCALE: NTS



2 TANK SIDE VIEW
SCALE: NTS



3 TANK RIGHT END VIEW
SCALE: NTS
(SKID SHOWN AS SECTION)

SPECIFIC NOTES FOR THIS SHEET:

- 1) 3" HIGH BLACK LETTERING x 1/2" STROKE TEXT AS FOLLOWS:
A. FLAMMABLE 4,500 GALLONS GASOLINE
B. COMBUSTIBLE 7,100 GALLONS DIESEL
- 2) LIFTING LUG WITH DOUBLER PLATE (MIN 2).
- 3) 4" SCH 80 TOW BAR, BOTH ENDS
- 4) TANK MOUNT LIGHT POLE BASE, SEE 17/SHEET 5 FOR LOCATIONS (TYP 2)
- 5) LADDER AND CATWALK ASSEMBLY (NOT SHOWN)
- 6) INSTALL WATER DRAW (SEE 15/SHEET 4)
- 7) INSTALL CLOCK GAUGE STILLING WELL (SEE 14/SHEET 4)
- 8) BOLT ON PIPE SUPPORT (SEE 13/SHEET 4)
- 9) STRUT SUPPORT STAND OFF, SHOP WELDED AT MID HEIGHT. (SEE 5/SHEET 2)
- 10) PLUG OPENING AFTER PUMPING INSULATION INTO INTERSTICE

GENERAL NOTES:

1. PROVIDE ONE PROTECTED 11,600 GALLON NOMINAL CAPACITY DUAL PRODUCT TANK AS SHOWN. MAX PRIMARY TANK DIMENSION: 10.5'φ x 18' L. THE GASOLINE COMPARTMENT SHALL HAVE 4,500 GALLON CAPACITY & THE DIESEL COMPARTMENT SHALL HAVE 7,100 GALLON CAPACITY.
2. TANK SHALL BE NEW UL 142 & 2085 LISTED AND LABELED.
3. ALL THREADED PENETRATIONS FNPT.
4. ALL REQUIRED PENETRATIONS, STANDOFFS, PIPE SUPPORTS, ETC., SHALL BE BOLT ON OR FACTORY INSTALLED. FIELD WELDING ON TANKS IS PROHIBITED. ALL FLANGED PENETRATIONS TO BE SCH 80 PIPE WITH 150# BUTT WELD, RAISED FACE FLANGE.
- 5.

NOMINAL TANK SIZE	11,600
DIMENSIONS	
DIAMETER INNER TANK	126"
DIAMETER OUTER TANK	132"
LENGTH INNER TANK	216"
LENGTH OUTER TANK	228"
LENGTH OVERALL	276"
SADDLE SPACING	4 @ 71"
CAPACITIES	
GASOLINE COMPT. (GALLONS)	4,500
DIESEL COMPT. (GALLONS)	7,100
OUTER TANK (GALLONS)	12,790
% CONTAINMENT	110%
MATERIALS	
INNER TANK	1/4"
OUTER TANK	1/4"
INNER & OUTER TANK HEADS	5/16"
SKID BEAMS	W8 X 35#
SADDLES	PL 1/4" X 12"
MISC SKID PARTS	PL 1/4"
TOWBAR	4" SCHED 80
OTHER DATA	
VENT SIZE	2"
Cu Ft/hr GASOLINE COMPT.	273,960
Cu Ft/hr DIESEL COMPT.	340,340
Cu Ft/hr OUTER TANK	392,000
E. VENT GASOLINE COMPT.	6"
E. VENT DIESEL COMPT.	8"
E. VENT OUTER TANK	8"

ANCHORAGE TANK & WELDING, INC.
2700 PORCUPINE DRIVE, ANCHORAGE, ALASKA 99501
(907) 272-3543

STEEL TANK INSTITUTE FIREGUARD®
U.S. PATENT NO. 5,695,099

THIS TANK REQUIRES EMERGENCY RELIEF VENTING. CAPACITY NOT LESS THAN THE FOLLOWING:
 PRIMARY TANK / COMPARTMENT A 4,500 GALLONS 273,960 CUBIC FT/HR
 PRIMARY TANK / COMPARTMENT B 7,100 GALLONS 273,960 CUBIC FT/HR
 ANNULAR SPACE CAPACITY 12,790 GALLONS 392,000 CUBIC FT/HR
 DATE OF MANUFACTURE: OCT 2014

UL
PROTECTED SECONDARY CONTAINMENT ABOVEGROUND TANK
FOR FLAMMABLE LIQUIDS UL SERIAL NUMBER XXXXXXXXX

FIREGUARD®
UL 2085, STI MH 17853

LISTED

- FOLLOW INSTALLATION INSTRUCTIONS • TANK IS INTENDED FOR STATIONARY INSTALLATION ONLY
- PRESSURIZE PRIMARY TANK WHEN PRESSURE TESTING ANNULAR SPACE
- THIS TANK SHALL BE INVESTIGATED TO DETERMINE ACCEPTABILITY OF USE AFTER FIRE EXPOSURE DAMAGE OTHER PHYSICAL DAMAGE, OR MISUSE
- IF A LEAK IS DETECTED (WATER OR FUEL) THIS TANK IS TO BE REMOVED FROM SERVICE. THE LOCAL CODE AUTHORITY AND TANK MANUFACTURER SHOULD BE CONTACTED TO DETERMINE IF THE INSULATION CAN BE REPAIRED OR REPAIRED.
- THIS TANK IS INTENDED FOR INSTALLATION IN ACCORDANCE WITH NFPA 30, NFPA 30A, NFPA 31, OR THE UNIFORM FIRE CODE STANDARD A-11-F-1
- INSULATED ABOVEGROUND TANK, PROTECTED TYPE • TANK LISTED AS A FIRE RESISTANT SECONDARY CONTAINMENT TANK
- PROJECTILE RESISTANT (IF PINCHED, STEEL THICKNESS MEETS REQUIREMENTS)

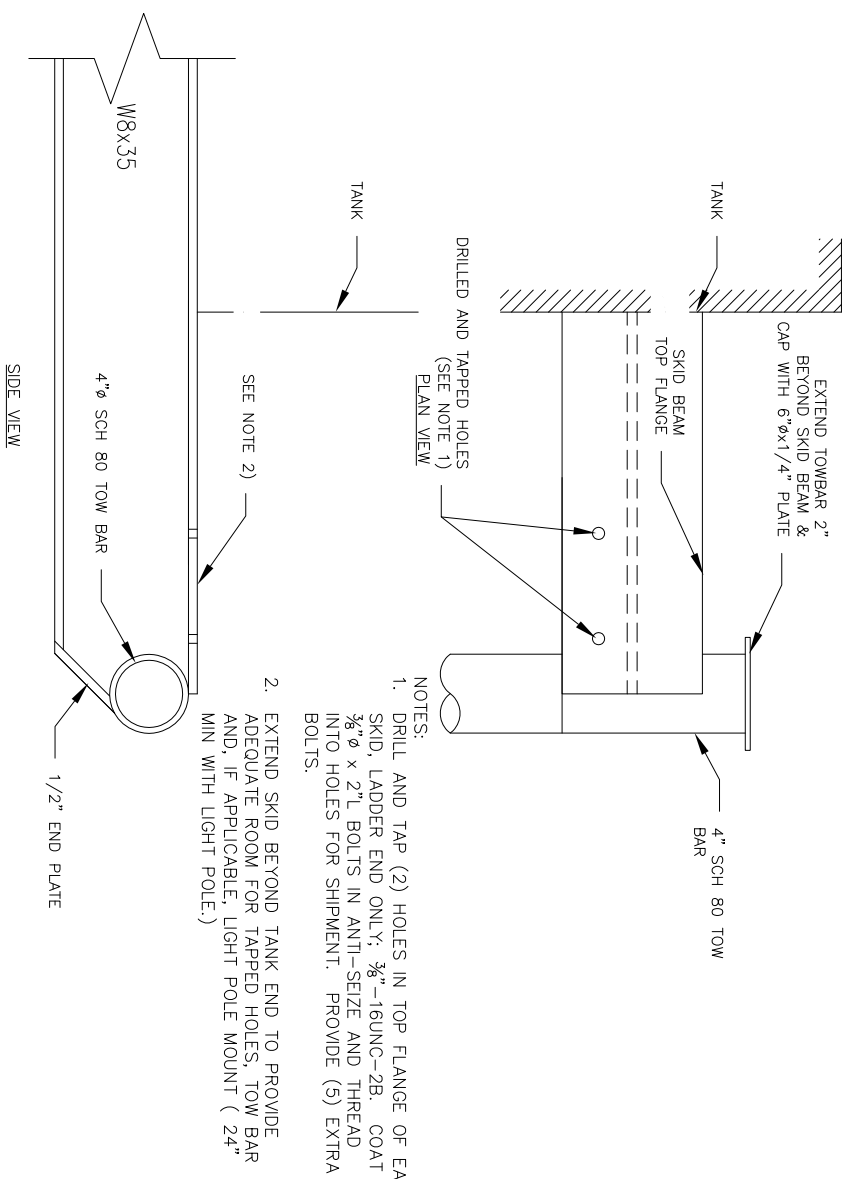
DRAWN:	TOM
DATE:	10/07/14
REVISED:	10/29/14
FILE NAME:	AE14F12M
JOB NO.:	2014-128
SCALE:	NTS
SHEET NO. OF	1 REV 1

11,600 Gallon Fireguard
2-Hour Rated Storage Tank
Alaska Energy Authority
Tatitlek Bulk Fuel Upgrade



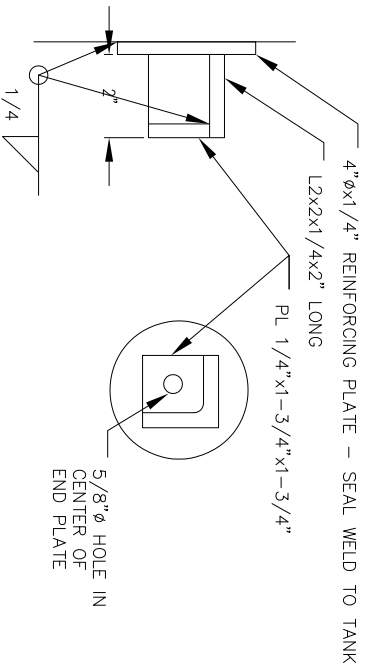
ANCHORAGE TANK
2723 RAMPART DRIVE
ANCHORAGE, ALASKA
(907) 272-3543





4 HOLES AT END OF SKID

SCALE: NTS



NOTE:
THE END PLATES OF STAND OFFS SHALL BE ON THE SAME VERTICAL PLANE. ANGLE LENGTHS MAY BE MODIFIED ±1 INCH TO ACCOUNT FOR CURVATURE OF THE TANK END.

5 STRUT SUPPORT STAND OFF

SCALE: NTS

TANK FABRICATION SPECIFICATIONS

**** GENERAL ****

PROVIDE SHOP FABRICATED CARBON STEEL TANK OF TYPE, CONFIGURATION, DIMENSION, AND CAPACITY AS INDICATED ON THE TANK FABRICATION DRAWINGS.

TANK SHALL BE RATED FOR STORAGE OF GASOLINE AND DIESEL FUEL AT ATMOSPHERIC PRESSURE OVER A TEMPERATURE RANGE FROM -40F TO +100F. MANUFACTURE IN ACCORDANCE WITH U.L. 142 AND U.L. 2085 AND PROVIDE WITH LABELS.

PROVIDE ALL ACCESSORIES, ATTACHMENTS, LADDERS, CATWALKS, SUPPORTS, AND FASTENERS AS INDICATED ON DRAWINGS. ALL FINAL BOLTED CONNECTIONS TO BE MADE IN FIELD. PROVIDE ALL FASTENERS AND HARDWARE REQUIRED AND VERIFY FIT.

LABEL FACES AND ENDS OF TANKS AS INDICATED ON DRAWINGS. LABEL ALL OPENINGS ON TOP OF TANKS WITH MINIMUM 3" HIGH LETTERS INDICATING FUNCTION AS LISTED IN PARENTHESSES ON TANK DRAWINGS. PROVIDE PERMANENT BLACK VINYL LETTERS OR STENCIL WITH BLACK POLYURETHANE PAINT.

**** HORIZONTAL TANK CONSTRUCTION ****

TANK SHELL JOINTS TO BE FULL PENETRATION BUTT WELDS, U.L. 142 FIGURE 6.1 #2. HEAD TO SHELL JOINTS TO BE SINGLE WELDED FULL FILLET LAP JOINTS, U.L. 142 FIGURE 6.2 #4 AS SHOWN BELOW.

PROVIDE WITH INTEGRAL STEEL SADDLE AND SKID FOUNDATION. SADDLES TO BE SEAL WELDED TO TANK - BOLT ON OR STRAP ON SADDLES WILL NOT BE ACCEPTED. PROVIDE MINIMUM 8" DEPTH STEEL "I-BEAM" SKID FOUNDATION OF MINIMUM 35# WEIGHT. SKIDS TO EXTEND 24" BEYOND EACH END OF TANK AND BE PROVIDED WITH 4" DIAMETER SCHEDULE 80 STEEL PIPE TOWBAR AT EACH END. CUT ENDS OF SKIDS AT 45 DEGREE ANGLE AND CAP END WITH PLATE OF WIDTH TO MATCH BEAM FLANGE. COMBINATION SADDLE AND SKID FOUNDATION TO BE DESIGNED TO LIMIT HEIGHT OF TANK BOTTOM TO 8" MAXIMUM ABOVE BOTTOM OF SKIDS AND TO ALLOW DRAGGING OF THE TANK AND LIFTING FROM EITHER END.

PROVIDE GROUNDING LUGS AT OPPOSITE CORNERS OF THE SKID.

**** OPENINGS AND ATTACHMENTS ****

PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. OPENINGS INDICATED AS FLANGES SHALL BE ANSI 150# PATTERN FLANGES WITH RAISED FACE. OPENINGS INDICATED AS FREGUARD FITTINGS SHALL BE FEMALE PIPE THREAD. FLANGES AND NOZZLES SHALL EXTEND BEYOND TANK SHELL 4" MINIMUM OR AS DIMENSIONED. MANHOLES SHALL BE 5/16" STEEL LID (SINGLE PUNCH), 1/4" MILD STEEL RING WITH 7" RISER HEIGHT, NOMINAL SIZE AS INDICATED.

INSTALL ALL FLANGES, NOZZLES, AND FREGUARD FITTINGS PLUMB, LEVEL AND SQUARE TO THE MAIN AXIS OF THE TANK IN ALL THREE PLANES. VERIFY BUNG ORIENTATION WITH PIPE NIPPLE. INSTALL FLANGES WITH BOLT PATTERN SQUARE TO TANK AXES. PIPING CONNECTIONS MORE THAN ONE DEGREE OUT OF ALIGNMENT SHALL BE CUT OUT AND RE-INSTALLED. VERIFY ALIGNMENT PRIOR TO PAINTING.

ATTACH ALL COMPONENTS PERMANENTLY WELDED TO THE TANKS INCLUDING STAND-OFFS. PROVIDE REINFORCING PLATES ON ALL STAND-OFFS. SEAL WELD ALL NON-STRUCTURAL SEAMS, AND ROUND CORNERS AND SHARP EDGES PRIOR TO SANDBLASTING AND PAINTING. REMOVE ALL DETACHABLE COMPONENTS PRIOR TO SANDBLASTING TANKS.

PROVIDE WITH LADDER AND CATWALK AS SHOWN ON THE DRAWINGS. SHOP FABRICATE LADDER AND CATWALK; VERIFY FIT; REMOVE; SANDBLAST ALL FABRICATIONS AND PAINT AS SPECIFIED; AND BAND TO PALLETS FOR SHIPPING. FURNISH WITH ALL FASTENERS REQUIRED FOR FIELD INSTALLATION.

**** PAINTING ****

TANK, SADDLES, SKIDS, STANDOFFS, LADDER, AND CATWALK - SANDBLAST TANK AND ALL WELDED ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-10. PRIME WITHIN 4 HOURS OF SANDBLASTING. PRIME WITH REINFORCED INORGANIC ZINC PRIMER; DEVCO CATHA-COAT 302H, COLOR GREEN, TO 3 MILS DRY FILM THICKNESS. COVER WITH ONE COAT OF EPOXY DEVCO BAR-RUST 236, COLOR GRAY, TO 6 MILS DRY FILM THICKNESS. FINISH WITH ONE COAT OF ALIPHATIC URETHANE ENAMEL, DEVCO DEVTHANE 389, COLOR WHITE, TO 3 MILS DRY FILM THICKNESS. DO NOT PAINT GALVANIZED GRIP STRUT.

PROVIDE 2 GALLONS OF TOUCH-UP FOR EACH COATING (TOTAL OF 6 GALLONS). DO NOT ALLOW COATINGS TO FREEZE.

AEA MAY WISH TO INSPECT SURFACE PREPARATION AND COATING OPERATIONS.

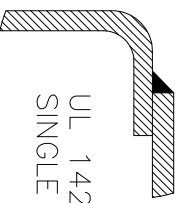
SUBSTITUTIONS OF PAINT WILL NOT BE ACCEPTED. PERFORM ALL PAINTING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

**** TRACTION ACROSS TANK TOP ****

APPLY 3M SAFETY WALK ADHESIVE TRACTION MATTING ALONG TANK TOP IN THE AREAS SHOWN ON THE DRAWING.

**** PREPARATION FOR SHIPPING ****

BOLT-ON COMPONENTS (LADDER, CATWALK, RAILINGS, PIPE SUPPORTS, ETC.) SHALL BE PACKAGED AND SHIPPED SEPARATELY FROM TANK. ALL THREADED TANK OPENINGS SHALL BE SEALED FOR SHIPPING WITH TIN PLUGS. ALL FLANGED OPENINGS SHALL BE BLIND FLANGED. PROVIDE A 1/2" MINIMUM DIAMETER OPENING TO ALLOW PRESSURE RELIEF DURING SHIPPING & STORAGE. TANK AND APPURTENANCES SHALL BE PACKAGED FOR OCEAN TRANSPORT. NOTIFY AEA A MINIMUM OF 2 WEEKS PRIOR TO SCHEDULED COMPLETION AS THEY MAY WISH TO INSPECT.



U.L. 142 FIGURE 6.2 NO.4
SINGLE WELDED FULL FILLET LAP JOINT

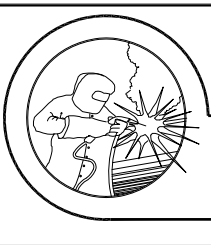
TANK WELD JOINTS



U.L. 142 FIGURE 6.1 NO.2
FULL PENETRATION BUTT WELD

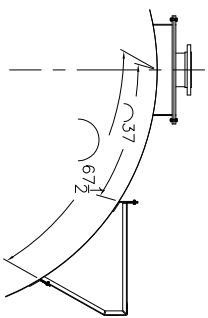
DRAWN:	TOM
DATE:	10/07/14
REVISED:	10/29/14
FILE NAME:	AEA14F12M
JOB NO:	2014-128
SCALE:	NTS
SHEET No. Of	2 REV 1

11,600 Gallon Fireguard
2-Hour Rated Storage Tank
Alaska Energy Authority
Tatitlek Bulk Fuel Upgrade

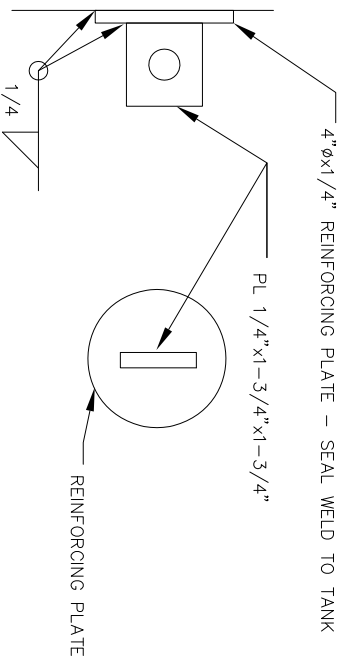


ANCHORAGE TANK
2723 RAMPART DRIVE
ANCHORAGE, ALASKA
(907) 272-3543

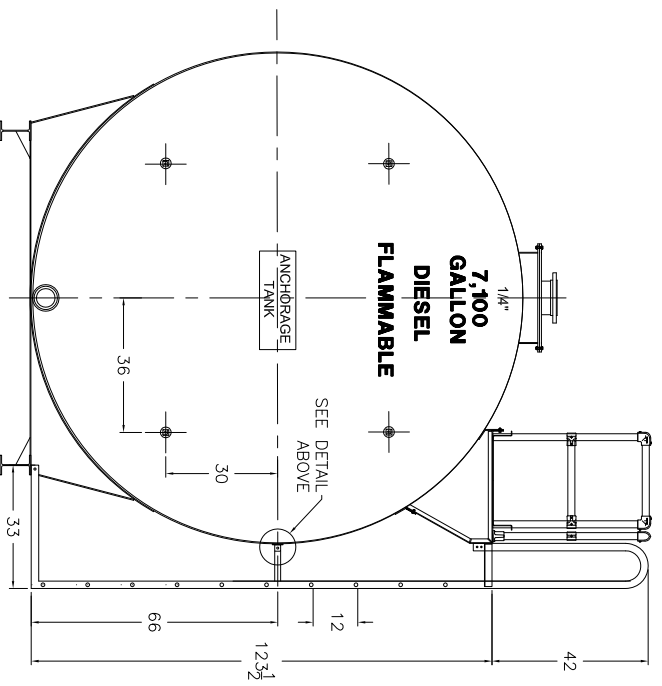




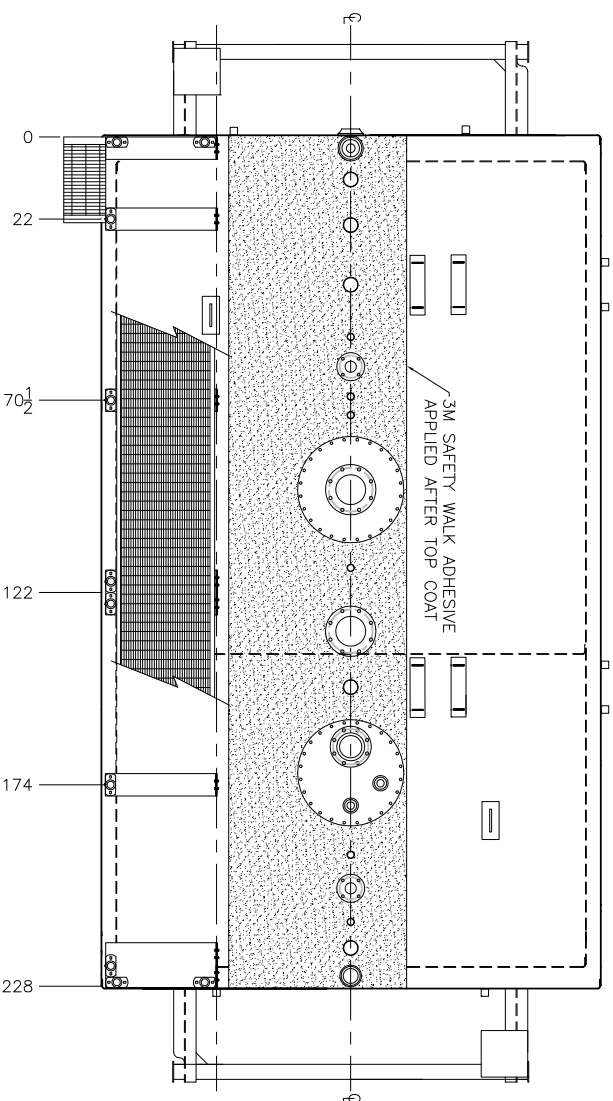
6 PLACEMENT OF PLATFORM SUPPORTS
SCALE: NTS



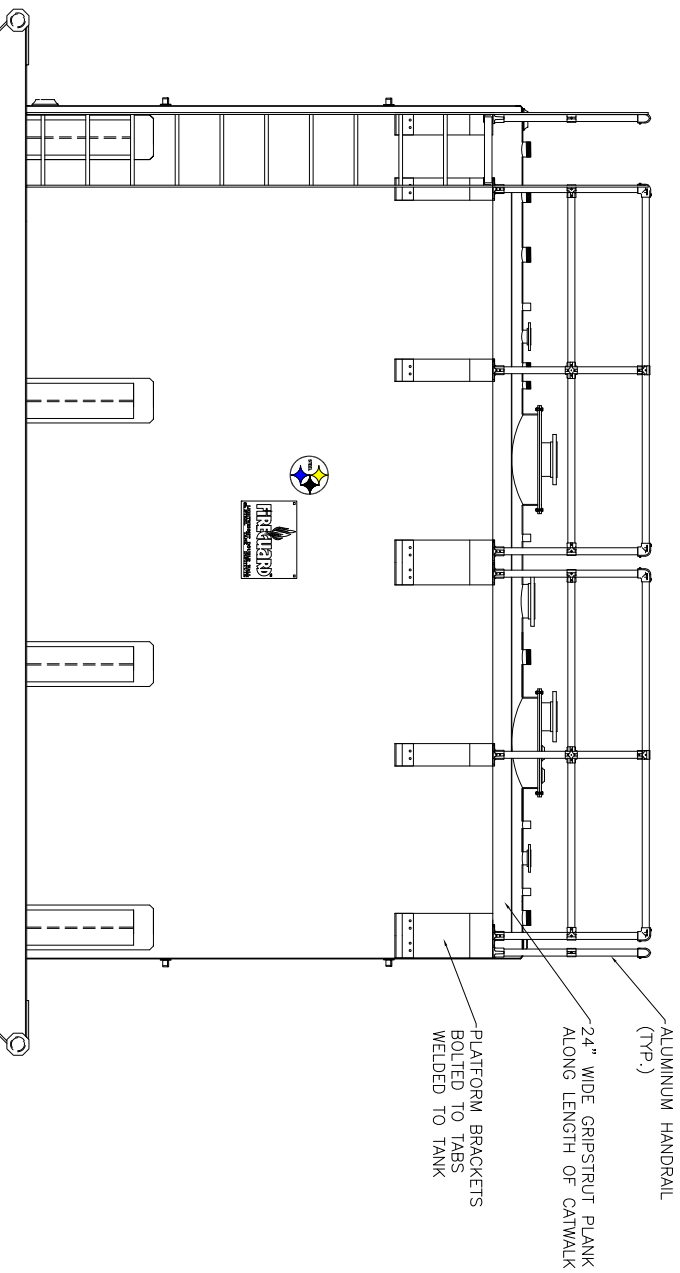
7 LADDER ATTACHMENT AT TANK MIDLINE
SCALE: NTS



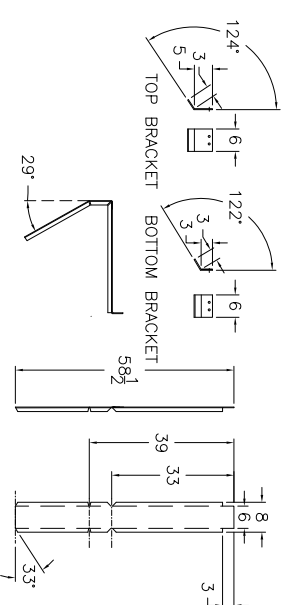
8 LADDER & CATWALK END VIEW
SCALE: NTS



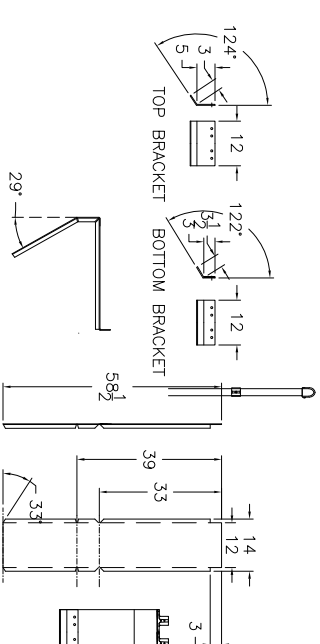
9 LADDER & CATWALK TOP VIEW
SCALE: NTS



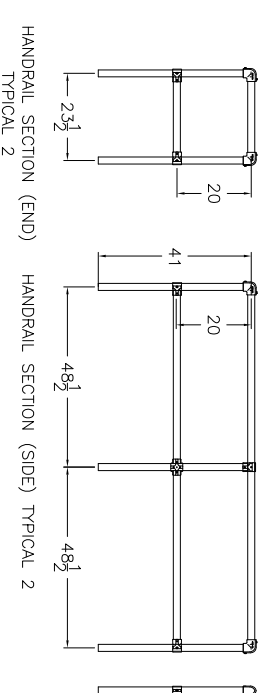
10 LADDER & CATWALK SIDE VIEW
SCALE: NTS



3/16" MATERIAL
4 EACH



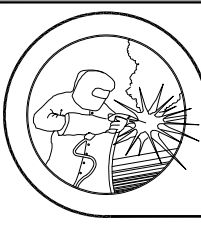
3/16" MATERIAL
2 EACH



12 ALUMINUM CATWALK HANDRAILS
SCALE: NTS

11 PLATFORM SUPPORT BRACKETS
SCALE: NTS

11,600 Gallon Fireguard
2-Hour Rated Storage Tank
Alaska Energy Authority
Tatitlek Bulk Fuel Upgrade



ANCHORAGE TANK

2723 RAMPART DRIVE
ANCHORAGE, ALASKA
(907) 272-3543

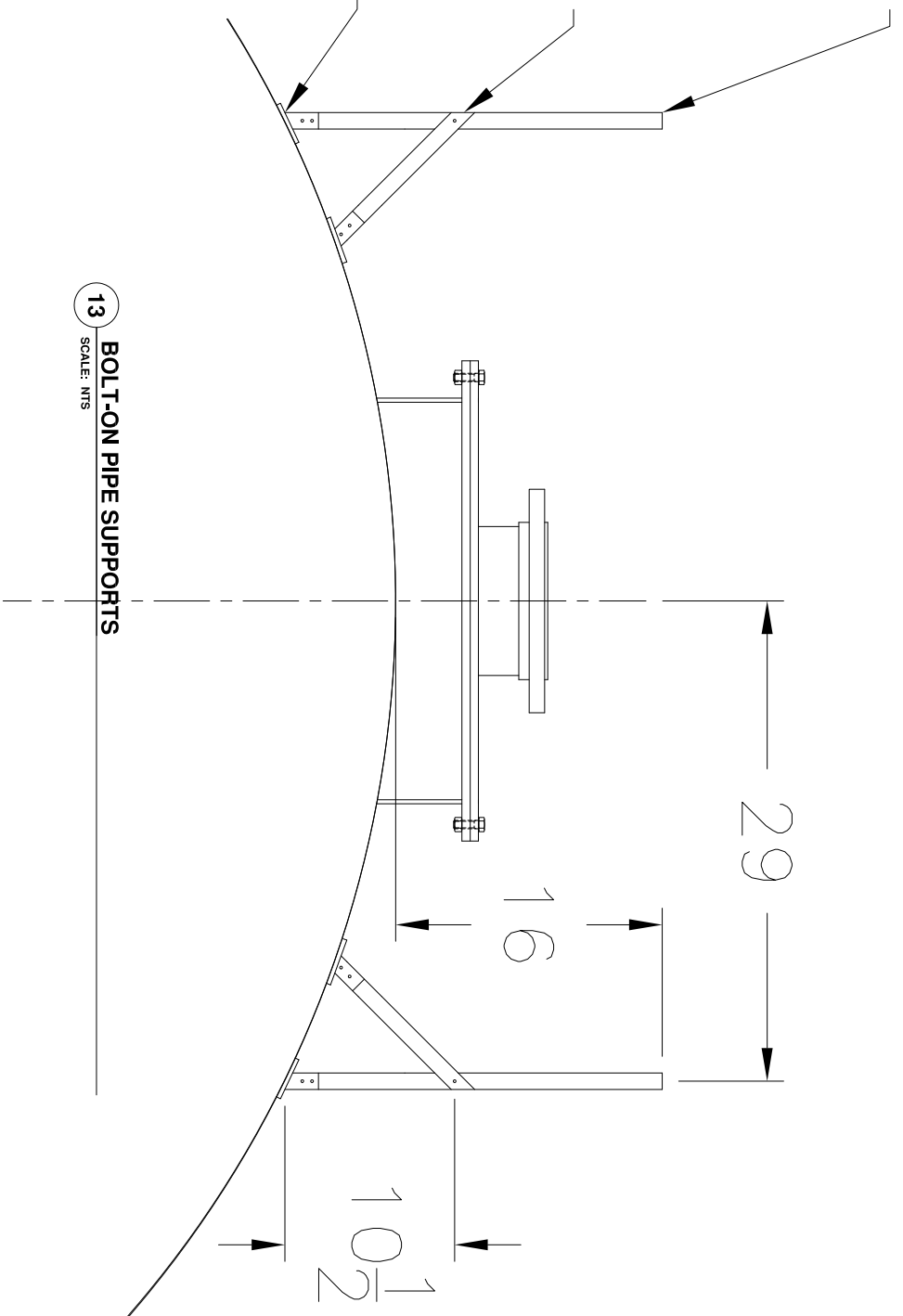


DRAWN:	TOM
DATE:	10/07/14
REVISED:	10/29/14
FILE NAME:	AE14F12M
JOB NO.:	2014-128
SCALE:	NTS
SHEET NO. OF	3 REV 1

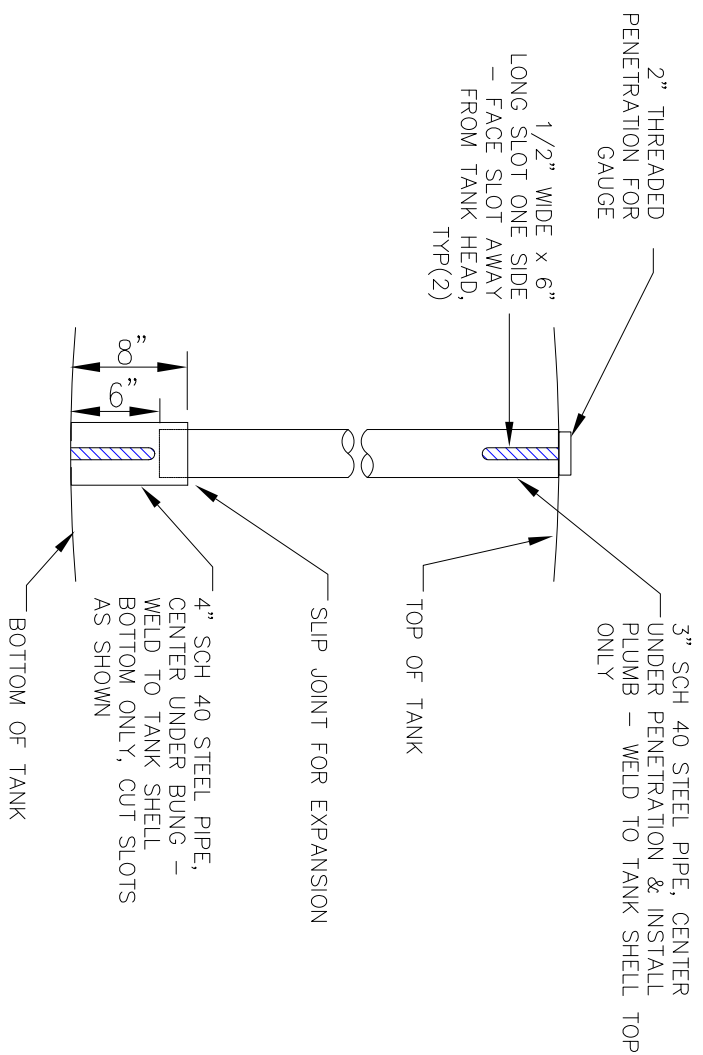
FB 1x1/4 REQ'D LENGTH
 1 EA PER VERTICAL
 ANGLE SUPPORT

1x1x1/4 ANGLE
 (TYP. 2 PER SUPPORT)

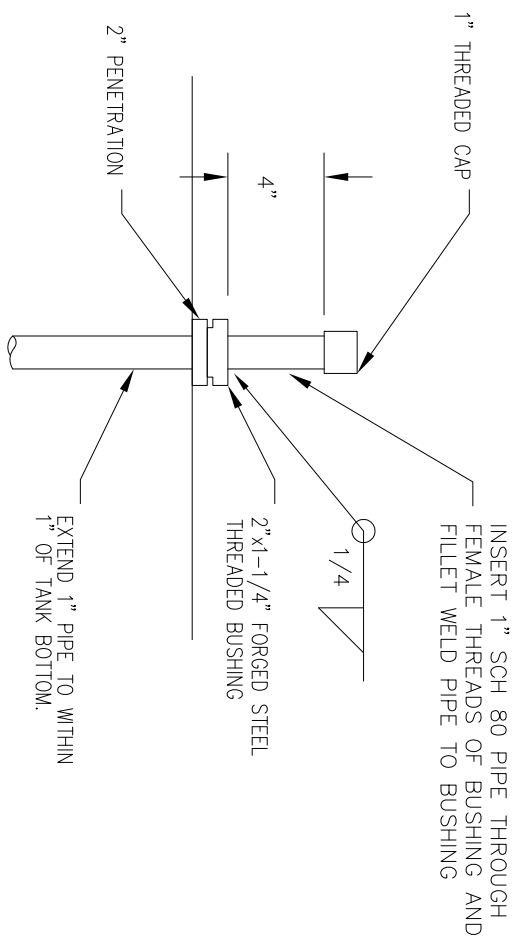
FB 1/4x1x1/4
 W/ 2 EA 5/8" Ø HOLES
 WELD TO DOUBLER PLATE
 (TYP. 2 PER SUPPORT)



13 BOLT-ON PIPE SUPPORTS
 SCALE: NTS

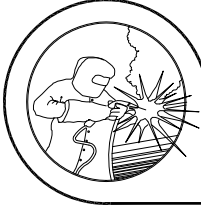


14 CLOCK GAUGE STILLING WELL
 SCALE: NTS



15 TYPICAL WATER DRAW
 SCALE: NTS

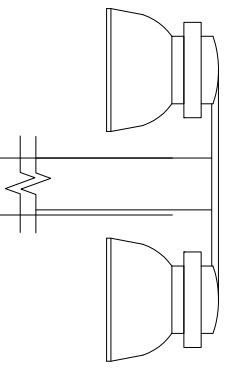
11,600 Gallon Fireguard
 2-Hour Rated Storage Tank
 Alaska Energy Authority
 Tatitlek Bulk Fuel Upgrade



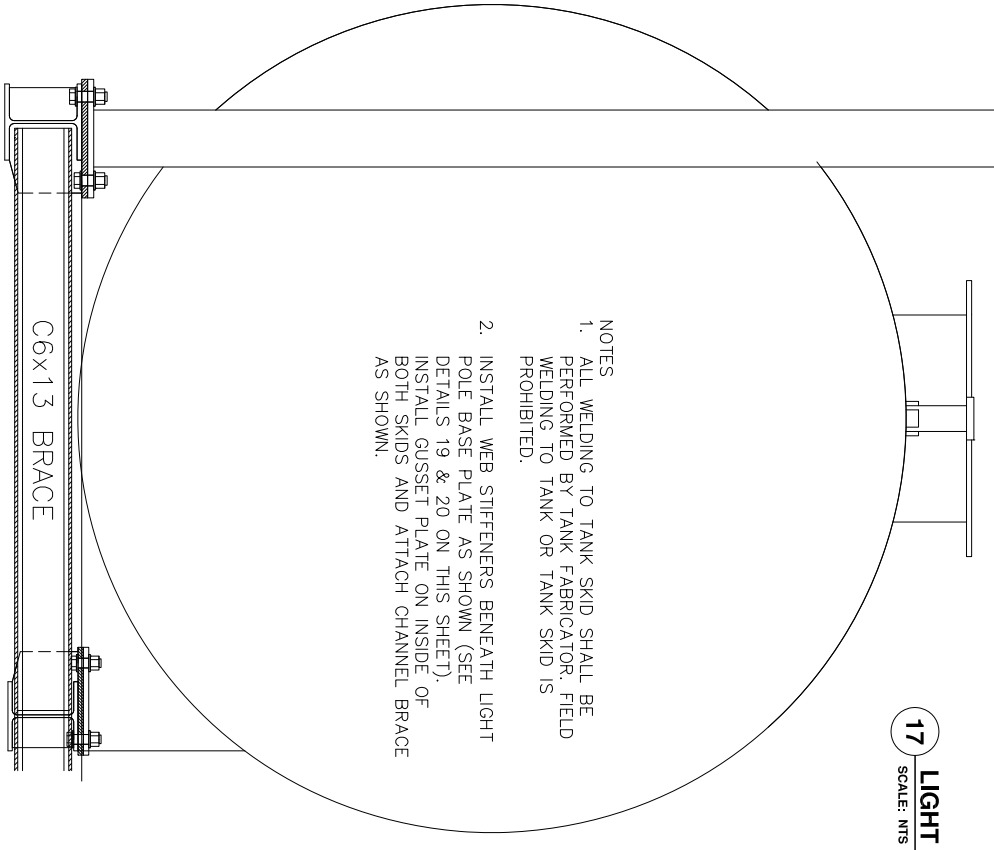
ANCHORAGE TANK
 2723 RAMPART DRIVE
 ANCHORAGE, ALASKA
 (907) 272-3543



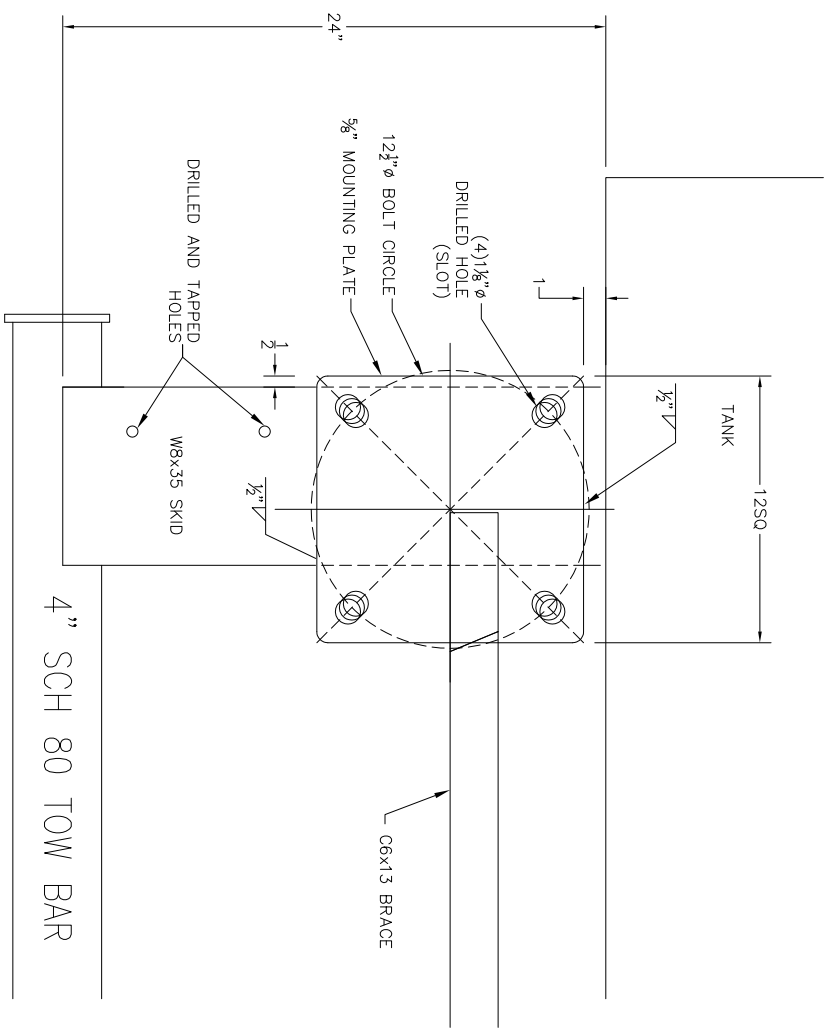
DRAWN:	TOM
DATE:	10/07/14
REVISED:	10/29/14
FILE NAME:	AEA14F12M
JOB NO.:	2014-128
SCALE:	NTS
SHEET No. OF	4 REV 1



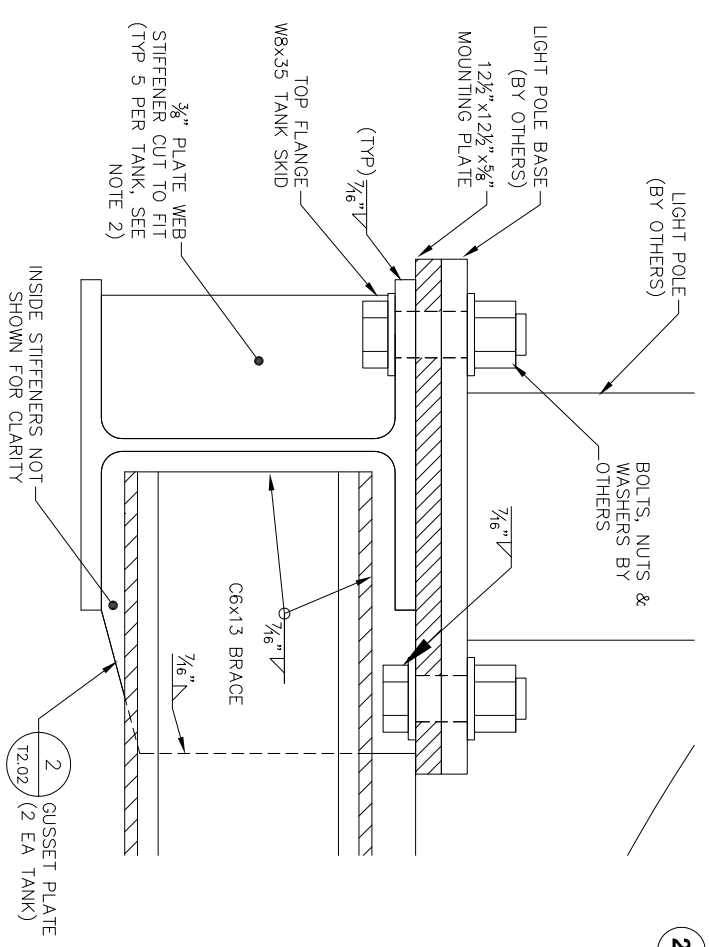
LIGHT POLE
(BY OTHERS)



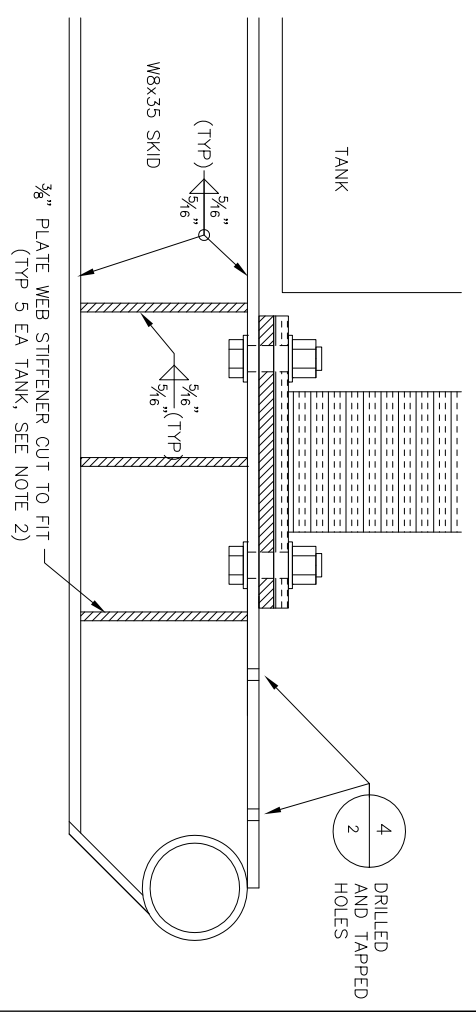
16 TANK MOUNT LIGHT POLE
SCALE: NTS



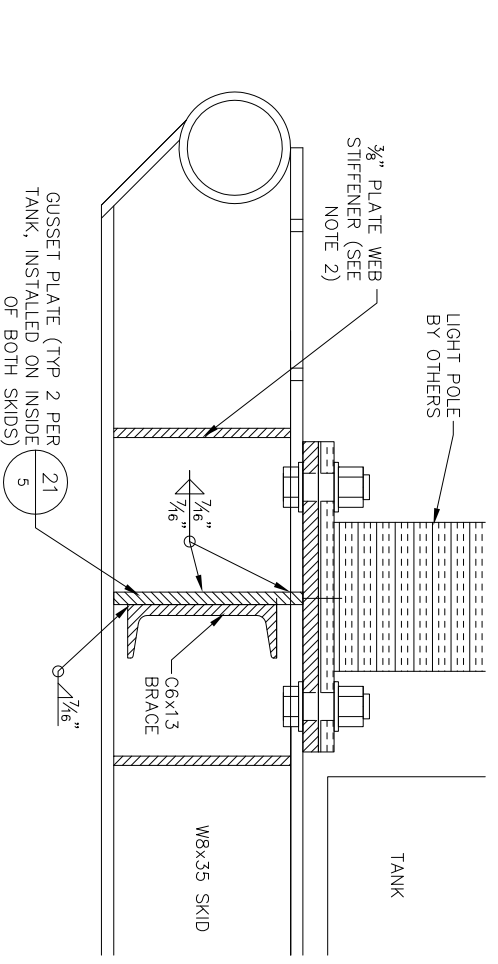
17 LIGHT POLE BASE PLATE TOP VIEW
SCALE: NTS



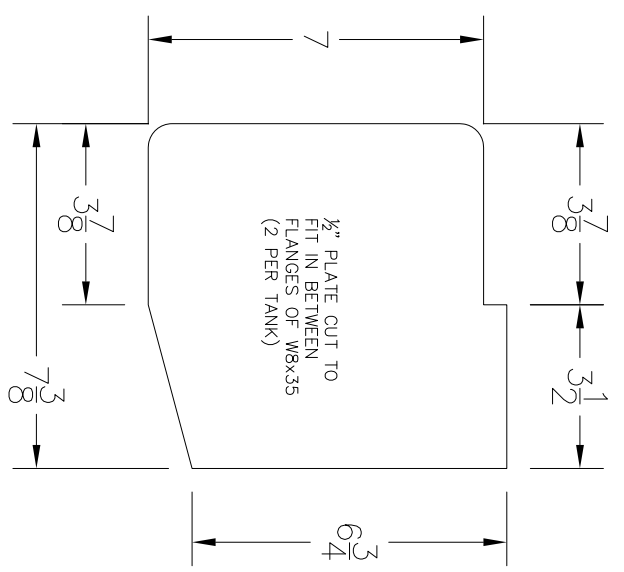
18 CHANNEL BRACE CONNECTION
SCALE: NTS



19 LIGHT POLE BASE - OUTSIDE SKID VIEW
SCALE: NTS



20 LIGHT POLE BASE - INSIDE SKID VIEW
SCALE: NTS



21 GUSSET PLATE CUT DIAGRAM
SCALE: NTS

- NOTES
1. ALL WELDING TO TANK SKID SHALL BE PERFORMED BY TANK FABRICATOR. FIELD WELDING TO TANK OR TANK SKID IS PROHIBITED.
 2. INSTALL WEB STIFFENERS BENEATH LIGHT POLE BASE PLATE AS SHOWN (SEE DETAILS 19 & 20 ON THIS SHEET). INSTALL GUSSET PLATE ON INSIDE OF BOTH SKIDS AND ATTACH CHANNEL BRACE AS SHOWN.

C6x13 BRACE

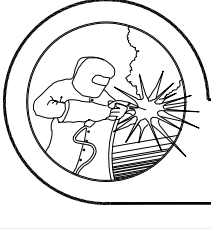
LIGHT POLE BASE
(BY OTHERS)
12 1/2" x 12 1/2" x 3/8"
MOUNTING PLATE
(TYP) 3/8"
TOP FLANGE
W8x35 TANK SKID
3/8" PLATE WEB
STIFFENER CUT TO FIT
(TYP 5 PER TANK, SEE
NOTE 2)

LIGHT POLE
(BY OTHERS)
BOLTS, NUTS &
WASHERS BY
OTHERS
7/8"
INSIDE STIFFENERS NOT
SHOWN FOR CLARITY
2 GUSSET PLATE
(2 EA TANK)
12.02

7/8"
C6x13 BRACE
7/8"

2 GUSSET PLATE
(2 EA TANK)
12.02

11,600 Gallon Fireguard
2-Hour Rated Storage Tank
Alaska Energy Authority
Tatitlek Bulk Fuel Upgrade



ANCHORAGE TANK
2723 RAMPART DRIVE
ANCHORAGE, ALASKA
(907) 272-3543



DRAWN:	TOM
DATE:	10/07/14
REVISED:	10/29/14
FILE NAME:	AEA14F12M
JOB NO.:	2014-128
SCALE:	NTS
SHEET NO. OF	5 REV 1