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SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Work Covered by Contract Documents
- B. Contract Method
- C. Work By Others
- D. Work Plans, Access to Facility, Individual Work Areas
- E. Contractor's Use of Premises
- F. Coordination
- G. Access for Testing and Inspection

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Provisions for use of site. Relations of Contractor- Subcontractors.
- B. Document 00800 - Supplementary Conditions Modifications to General Conditions (Document 00700) for this Contract.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work under this unit price lump sum Contract comprises construction of a new bulk fuel tank farm and related fuel system upgrades in the community of Edna Bay, Alaska.
 - 1. **Basic Bid** – Provide all labor, materials and equipment required to construct Bid Items 1 through 8 as described in 1.04 Description of Bid Items below.
 - 2. **Additive Alternate** – Provide all labor, materials and equipment required to construct Additive Alternate Bid Item A as described in 1.04 Description of Bid Items below.

1.04 DESCRIPTION OF BID ITEMS

A. Bid Item #1: Mobilization / Demobilization

1. The unit price for Mobilization/Demobilization shall include but not be limited to 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, prefabricated structures, equipment and personnel to and from the jobsite.
- c. Erecting and maintaining all 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 the contract specifications and drawings.
- 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. Mobilization/Demobilization costs for all subcontracted work shall be considered to be included.

3. Items which are not to be included in this item include but are not limited to:

- a. Any portion of the Work covered by a specific Bid item or incidental work which is to be included in a Bid item or items.

B. Bid Item #2: Earthwork and Tank Farm Secondary Containment System

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required for construction of the following:

- a. Earthwork: Construct gravel pad foundations, entrance drives, and project security fence components, including material source development, manufacture and/or importation of classified fill, clearing and grubbing, waste material disposal, dewatering, surface preparation, hauling, stockpiling, geotextile installation, soil stabilization and reinforcement, excavation and embankment construction, retaining wall construction, erosion control, compaction and finish grading of classified fill, and fence and gate installation as shown in the drawings and/or required by the specifications.
- b. Tank farm secondary containment system: Install precast and cast in place concrete blocks, steel tie-plates, geotextile and fuel resistant membrane

liner, stairs and walkways, interior-dike drainage piping and sumps, sheet metal dike covers, sump siphon assemblies, and place, compact and perform finish grading of classified fill within the lined concrete dike as shown in the drawings and/or required by the specifications.

C. Bid Item #3: Tanks and Tank Appurtenances

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to furnish and install all aboveground storage tanks and tank appurtenances including all ladders, catwalks, vents, clock gauges, floats, water draws, tank mounted pipe supports, drop tubes, penetrations, saddles, skids, warning signs and information placards, concrete tank foundation systems, and other tank appurtenances as shown on the drawings and/or required by the specifications.

D. Bid Item #4: Three Product Tank Farm Fill System

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to furnish and install three fill headers, header supports, drip basins, piping between the truck headers and the bulk tanks, all valves, fittings, strainers, cam lock couplings, tags, and magnesium anodes, perform all necessary trenching, backfill and compaction, coating and testing as required to provide a fully functional tank farm fill system.

E. Bid Item #5: Dispensing Systems and Electrical

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to construct the following:

- a) Dispensing Systems: Furnish and install retail and fleet dispensing system components, including submersible pumps in the bulk/dispensing tanks, a dual product retail dispenser, dispenser/hose reel enclosures, hose reels, pipelines between the retail/fleet dispensers and the submersible pump discharges, all filters, meters, grounding reels, valves, fittings, strainers, flex connects, pressure relief valves, signage, tags, magnesium anodes and other components as required, perform all necessary trenching, backfill and compaction, welding, coating, and testing as required to provide fully functional dispensing systems.
- b) Electrical: Furnish and install all conduit, conductor, ground systems, control panels, light poles, light fixtures, dispensing point of sale systems, communication links, emergency shutoffs, and other work required to make all project electrical systems fully functional as shown on the drawings and/or required in the specifications.

F. Bid Item #6: Attendant Kiosk

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to furnish and install a new or like-new 8-ft by 20-ft, weather-tight connex van and perform modifications to the connex van to serve as an attendant kiosk and storage area for spill response equipment. Connex modifications include installation of insulation and plywood sheathing on ceiling, walls and floor, painting of interior and exterior finished surfaces, installation of exterior door, interior walls,

windows, shelving, and other improvements as shown on the drawings and/or required by the specifications. Electrical improvements for attendant kiosk are covered under Bid Item 5.

G. Bid Item #7: Spill Response Equipment

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to provide the spill response equipment listed in the Contract Specifications and secure the equipment within the attendant kiosk connex van in accordance with the Contract Drawings and Specifications.

H. Bid Item #8: Self Contained Diesel Genset

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to furnish and install a self-contained diesel generator set as shown in the drawings and/or required in the specifications.

I. Additive Alternate A: Truck Transfer Secondary Containment

1. The unit price for this bid item shall include all labor, materials, equipment and incidentals required to Furnish and install a steel truck transfer secondary containment basin, perform all necessary grading, welding, trenching, backfill and compaction, coating and testing, install all sumps, sump drains, valve boxes, valves, magnesium anodes, grip strut walkways, ramps, expanded metal and other items as required to provide a fully functional, liquid tight containment basin as shown on the drawings and/or required by the specifications.

1.05 CONTRACT METHOD

A. This is a Lump Sum Contract.

1.06 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 AUTHORITY to minimize conflicts.

B. Notify the Authority immediately if conflicts will interfere with the progress of the work.

1.07 CONTRACTOR'S USE OF PREMISES

A. Coordinate staging area with Owner prior to placing equipment or supplies at the project site. 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 and the Authority 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.

1.09 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.
- E. Contractor is responsible for coordinating with the USFS and DNR for use of the Marine Transfer Facility staging area and Barge Landing.
- F. Multiple, privately owned borrow pits and overburden disposal areas exist in town. Contractor is responsible for coordination with City and local land owners.

1.10 ACCESS FOR TESTING AND INSPECTION

- A. Provide access for AUTHORITY 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 01020

INTENT OF DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

Document 00700 - General Conditions

1.03 SPECIFICATION FORMAT AND COMPOSITION

- A. Specifications are divided into Divisions and Sections for convenience. 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.

1.04 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.

1.05 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.

1.06 CONFLICTS

- A. Report any conflicts to Authority for clarification.

Bulk Fuel Upgrade
Edna Bay, Alaska

PART 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01027

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Article 13, Progress Payments, and Final Payment.
- B. Document 00800 – Supplementary Conditions.
- C. Section 01300 - Submittals: Submittal procedures.
- D. Section 01370 - Schedule of Values.
- E. Section 01701 - Contract Closeout Procedures: Final Payment.
- F. Section 01720 – Project Record Documents.

1.03 FORMAT

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

1.04 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. Prepare Application for Final Payment as specified in Section 01701.

1.05 SUBMITTAL PROCEDURES

- A. Submit three copies of each Application for Payment at times stipulated in Contract.
- B. Submit under AUTHORITY accepted transmittal letter. See Section 01370 - Schedule of Values. Identify contract by AUTHORITY contract number.

1.06 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. Show Application number and date, and line item by number and description.

1.07 SUBMITTALS WITH APPLICATION FOR PAYMENT

- A. Submit the following with each Application for Payment.
 - 1. Updated construction schedule as required by Section 01300 - Submittals.
 - 2. Updated Schedule of Values as required by Section 01370 - Schedule of Values.
 - 3. A minimum of 6 electronic photos showing progress for the pay period. Each photo shall be labeled identifying the subject matter and date.
 - 4. Evidence of transmittal of certified payrolls.
 - 5. A copy of all survey field notes and evidence that the Project Record Documents are current and in required condition.

PART 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01028

CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures for processing Change Orders.

1.02 RELATED REQUIREMENTS

- A. Bid Schedule: Total amount bid for lump sum items
- B. Construction Contract: Total amount of Contract Price, as awarded
- C. Document 00700 - General Conditions: Article 9, Governing requirements for changes in the Work, in Contract Price, and Contract Time.
- D. Document 00800 - Supplementary Conditions: Modifications to Document 00700 - General Conditions.
- E. Section 01027 - Applications for Payment.
- F. Section 01300 - Submittals: Progress Schedules.
- G. Section 01370 - Schedule of Values.
- H. Section 01630 – Product Options and Substitutions.
- I. Section 01700 – Contract Closeout: Project Record Documents.

1.03 SUBMITTALS

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

1.04 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

- A. Maintain detailed records of work done on a Cost of the Work plus a Fee 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.
- B. CONTRACTOR shall submit a complete, detailed, itemized cost breakdown addressing impact on Contract Time and Contract Price with each proposal.
- C. On request, provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.

2. Taxes, insurance and bonds.
 3. Overhead and profit.
 4. Justification for any change in Contract Time.
 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work done on a cost of the Work plus a Fee 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.

1.05 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.

1.06 CONSTRUCTION CHANGE AUTHORIZATION

- A. Shall be in accordance with Article 9 - Changes: in Document 00700 - General Conditions.

1.07 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 Document 00700 – General Conditions
- C. These terms shall also apply to the proposals of subcontracts and allowances.

1.08 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.

1.09 COST OF THE WORK CHANGE ORDER

- A. CONTRACTOR shall submit documentation required in Paragraph 1.04 of this Section on a daily basis for certification by the Authority. The 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 the AUTHORITY, the CONTRACTOR shall submit in final form an itemized account with support data of all costs. Support data shall have been certified by the 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 subschedules to adjust times for other items of Work affected by the change, and resubmit.
- C. Promptly enter changes in project record documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01030
CONSTRUCTION SURVEYING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section is intended to establish a standard minimum level of acceptable field survey specifications and procedures to properly control the construction project.

1.02 RELATED SECTIONS

- A. Section 1720 - Project Record Documents

1.03 SCOPE OF WORK

- A. 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.
- B. 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 Engineer prior to its use.
- C. All survey work performed shall be under the direct supervision of a Professional Land Surveyor registered in the State of Alaska.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 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, the Engineer shall be notified 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 Engineer.
- 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.

3.02 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 owner 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 Owner. 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 owner 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 Engineer by 12:00 PM the following workday. The Engineer 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 Engineer.

3.03 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 Engineer and signature.
- B. This record shall be kept on the project site and submitted to the Engineer upon request. A copy of the diary shall be submitted to the Owner upon completion of the project.

3.04 CLEARING AND GRUBBING LIMITS

- A. The Contractor shall stake the clearing and grubbing limits as required to accomplish all work as shown on the Contract Drawings and as directed and approved by the Engineer. Stakes shall be adjusted to avoid sharp breaks in the width of the clearing line.
- B. Distances shall be measured to the nearest foot and standard lath/flagging shall be placed to clearly designate the intended limits. Intervals for placement of lath/flagging shall vary based upon the terrain and foliage density, spacing of 50 to 100 feet will generally be adequate.

the survey field book.

3.05 GRAVEL PAD FOUNDATION STAKING

- A. General
 - 1. Rough grade stakes shall be used for horizontal and vertical location of the following features as appropriate:
 - a. driveway entrance
 - b. center of tank pad
 - c. culvert ends
 - d. ditch inflection point
 - e. centerline of ditches, at 20-foot offsets, at approximately 25-foot intervals
 - f. top edge of the pad
 - 2. See 3.06 C 1 for the general staking guidelines.
- B. Slope Stakes
 - 1. Slope stakes shall be set at points where the cut or fill slopes intersect the surface of original ground. Interval distance between slope stakes shall be as directed by the Engineer. The information to be shown on the slope stakes is as follows:
 - a. Distance from the catch point to the point being staked
 - b. Percent of slope cut/fill
 - c. Amount of cut/fill
 - d. Stakes' location in reference to ditch centerline

If at any time the planned design grade is found to be unworkable in the field, the Engineer shall be notified immediately and all slope staking shall cease until further notice from the Engineer.

2. Staking notes shall show a sketch of the area with a record of the location of the slope stake in relation to the ditch centerline, the existing elevation shot at the catch point, the planned elevation that the slope stake is identifying, and the distance to the point being slope staked.
3. The use of hand levels for setting slope stakes shall be limited to one turning point up or down from the instrument to the catch point. Hand level turning points shall be clearly noted in the field book.
4. A reference stake shall be set for each slope stake. The reference stake shall be set a minimum of 10 feet and a maximum of 15 feet beyond the slope stake. The reference stake shall re-state the slope stake information for use if the original slope stake is disturbed or destroyed. A hub shall be driven flush with the ground at the reference stake and all elevations and distances referenced to the hub.

C. Finish Grade Stakes

1. Finish grade hubs shall be set to verify the top of pad elevation and driveway entrance elevation after foundation fill has been applied. Wooden hubs, painted or topped with colored whiskers, shall be set within five hundredths of a foot tolerance. Horizontal position of finish grade hubs shall be as determined by the Engineer.
2. The field book shall contain a sketch showing the approximate horizontal position of the set hub, the design finish grade elevation, and the elevation of the hub.

3.07 MISCELLANEOUS CONSTRUCTION STAKING

- A. The Contractor shall provide sufficient stakes for the adequate control of all structures and incidental construction not specifically covered above. 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.

3.08 ELECTRONIC DATA COLLECTION AND RADIAL SURVEYS

- A. 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.

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

- A. As-built survey measurements shall be recorded on a clean set of 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 01720.
- 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. When electronic data collection is used to obtain as-built information, the following information shall be maintained and submitted:
 1. A printout of the unedited, raw data from the data collector
 2. An explanation of all codes and abbreviations used
 3. A printout of the x, y, and z coordinates
 4. 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 Engineer and the Engineer 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 Engineer, 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 Engineer at the completion of construction activity, in accordance with Section 01720 Project Record Documents, of these Specifications.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Quality assurance.

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Paragraph 3.4.2.

1.03 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 Engineer 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 Engineer 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 01126

CONTRACTOR'S CERTIFICATION OF SUBCONTRACT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Document 00100 – Information to Bidders, Requirements of Apparent Low Bidder.
- B. Document 00430 – Subcontractor List
- C. Document 00700 – General Conditions: Paragraph 6.13.1, Subcontractor Certification and Approval.
- D. Section 01300 - Submittals: Procedures (in general).

1.03 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.

1.04 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.

1.05 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 1.04 of this Section.

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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.

1.06 ACKNOWLEDGMENT OF CERTIFICATION

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

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Section 01010 – Summary of Work: Coordination of Work.
- B. Section 01300 - Submittals: Progress Schedules.
- C. Section 01340 - Shop Drawings, Product Data, and Samples.
- D. Section 01400 - Quality Control.
- E. Section 01700 - Contract Closeout: Project record documents.
- F. Section 01700 - Contract Closeout: Operation and maintenance data.

1.03 PRECONSTRUCTION CONFERENCES.

- A. AUTHORITY will administer preconstruction conference (at the AUTHORITY 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.

1.04 PROGRESS MEETINGS

- A. CONTRACTOR shall schedule and administer weekly Project meetings throughout progress of the work (unless this requirement is waived by Authority).
- B. Attendance: Job superintendent, major Subcontractors and Suppliers; AUTHORITY and Engineers as appropriate to agenda topics for each meeting.
- C. 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.

1.05 PREINSTALLATION CONFERENCES

- A. When required in individual Specification section, or directed by the AUTHORITY convene a pre-installation conference prior to commencing Work of the section.
- B. Require attendance of entities directly affecting, or affected by, Work of the section.
- C. Review conditions of installation, preparation and installation procedures, and coordination with related Work.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Section 01010 - Summary of Work: Work sequence.
- B. Section 01027 - Applications for Payment: Submittal of Applications.
- C. Section 01340 - Shop Drawings, Product Data, Samples: Submittal requirements.
- D. Section 01370 - Schedule of Values: Submittal of Schedule of Values.
- E. Section 01400 - Quality Control: Manufacturers' field service reports.
- F. Section 01400 - Quality Control: Testing reports.
- G. Section 01600 – Material and Equipment: Contractor's list of Products.
- H. Section 01700 - Contract Closeout: Project Record Documents, Warranties and Bonds: Closeout submittals.
- I. Section 01701 - Contract Closeout Procedures: Closeout submittals.

1.03 PROCEDURES

- A. Deliver submittals to AUTHORITY as directed.
- B. Transmit each item under AUTHORITY - accepted form. Identify Project, CONTRACTOR, Subcontractor, major Supplier, identify pertinent Drawing sheet and detail number, and Specification section number, as appropriate. Identify deviations from Contract Documents by submitting an AUTHORITY supplied 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 five copies in accordance with Document 00700 - General Conditions. Form and content shall be reviewed by the AUTHORITY. After review by AUTHORITY 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 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.
- 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, the AUTHORITY will not review the submittal and will immediately return submittal to CONTRACTOR. AUTHORITY will review a submittal no more than three times (incomplete or improper submittals count as one). CONTRACTOR shall pay all review costs associated with more than three reviews, unless a resubmittal is required due to new comments addressing previously submitted information.

1.04 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.

1.05 SCHEDULE OF VALUES

- A. Submit in accordance with Section 01370 - Schedule of Values.

1.06 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Submit in accordance with Section 01340 - 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.

1.07 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.

1.08 QUALITY CONTROL DATA

- A. Submit in accordance with Section 01400 – Quality Control, and individual specification sections.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures for submittals.

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Definitions, and basic responsibilities of entities.
- B. Section 01010 - Summary of Work: Coordination of work and submittals.
- C. Section 01300 - Submittals: Schedules for submittals and submittal procedures.
- D. Section 01400 - Quality Control: Mockups, and samples for testing.
- E. Section 01630 - Product Options and Substitutions
- F. Section 01700 - Contract Closeout: Project Record Documents.

1.03 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".

1.04 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, and 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.

1.05 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.
- D. Label each sample with identification required for transmittal letter.
- E. Provide field samples of finishes at Project, at location acceptable to AUTHORITY, as required by individual Specification section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed Work.

1.06 MANUFACTURER'S INSTRUCTIONS

- A. Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing, and finishing under provisions of Section 01400.

1.07 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. Sign or initial each sheet of Shop Drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify AUTHORITY 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.

1.08 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 letter designator. Example: 1st submittal "01010 1.08A" 2nd submittal 01010 1.08A - A".
- 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 number of opaque reproductions of shop drawings CONTRACTOR requires, plus four which will be retained by AUTHORITY.
- G. Submit number of copies of product data and manufacturer's instructions CONTRACTOR requires, plus four copies which will be retained by AUTHORITY.
- H. Submit number of samples specified in individual Specifications sections.
- I. Submit under AUTHORITY accepted transmittal form letter. Identify Project by title and AUTHORITY Project number; identify Contract by AUTHORITY 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.

1.09 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 AUTHORITY 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;

"No Exceptions Taken" - denotes that the submittal generally meets the requirements of the Contract Documents. "No Exceptions Taken" does not indicate a review of the CONTRACTOR's design except for general compliance with the requirements of the Contract Documents.

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

"Amend - 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 - Resubmit" - 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 the AUTHORITY 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 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. Within 15 days of Notice to Proceed, transmit 4 copies of submittal schedule. Submittal schedule to include a list of anticipated submittals. Schedule shall include submittal description, specification reference, and drawing sheet number, as appropriate.
- B. Submit shop drawings, product data and samples as required for each specification section.

Part 2 – PRODUCTS

Not Used

Part 3 – EXECUTION

Not used

END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions. Schedule of Values.
- B. Section 01010 - Summary of Work: Work sequence.
- C. Section 01027 - Applications for Payment: Procedures for Applications for Payment.

1.03 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 for listing component parts. Identify each line item by number and title of listed Specification sections.

1.04 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. Section 01701 - Contract Closeout Procedures. Value of all required Substantial Completion Submittals and Closeout Submittals shall be \$25,000.
 - 2. No progress payments will be made for Substantial Completion Submittals and Closeout Submittals until **all** submittals have been submitted to and accepted by the AUTHORITY.
- G. The sum of values listed shall equal total Contract Price.

1.05 SUBMITTAL

- A. Submit four copies of Schedule 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 under AUTHORITY accepted form transmittal letter. Identify Project by AUTHORITY title and Project number; identify Contract by AUTHORITY Contract number.

1.06 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 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 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Article 12, Quality Assurance.
- B. Section 01300 – Submittals: Submittal of Manufacturer's Instructions.
- C. Section 01340 - Shop Drawings, Product Data, and Samples: Submittal of Manufacturer's Instructions.
- D. Individual Specification Sections: Quality Control Requirements.

1.03 QUALITY CONTROL, GENERAL

- A. The Contractor shall assure that all materials and completed construction conform to contract Plans, Specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. The Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be used.

1.04 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.

1.05 MANUFACTURERS' 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.

1.06 MANUFACTURERS' CERTIFICATES

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

1.07 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.

1.08 MANUFACTURERS' 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.

1.09 Test 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 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

- A. Section 01010 - Summary of Work
- B. Section 01568 – Erosion Control

1.03 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.

1.04 SUBMITTALS

- A. Submit four copies of written Plan for providing any temporary facilities. Submit plan a minimum of 60 days prior to project startup unless otherwise specified in 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 Water Systems

1. Furnish and install all necessary components and systems to provide water for construction activities, and potable water for Contractor's crews and field office personnel.
2. Contractor furnished items include, but are not limited to, all piping, valves, fittings, insulation, pumps, tanks, fixtures, water heaters, tie-ins, and service agreements.
3. Contractor to provide and pay for all water and temporary water system related components and fees.

B. Temporary Sanitation Systems

1. 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.

C. Temporary Electrical Systems

1. Furnish and install all necessary components and systems to provide 120/240 VAC single phase electrical service to the field office and required electrical service at all work areas.
2. Contractor furnished items include, but are not limited to, all generators, conductors, transformers, service meters and masts, distribution panels, controls, electrical and lighting fixtures, tie-ins, and service agreements.
3. Contractor to provide and pay for all temporary electrical system related components and fees.

D. Temporary Heating Systems

1. 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, fuel, 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.

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

1. 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, computers, 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: 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.

3. Furnish all required first aid and fire suppression equipment required by laws and regulations.

4. 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.
- C. The community is not equipped with utility scale power generation or distribution systems, or water distribution / sewage collection systems.
- 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.
- I. 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.

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. Temporary storage yard shall be constructed for storage of products that are not subject to damage by weather conditions.
- 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 Engineer.

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 collect and properly dispose of sanitary and non-storm waste flows. Contractor shall not cause or permit action to occur which would cause an overflow to an existing waterway.

C. Erosion Control:

1. As specified in Section 01568.

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, 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, with a material identified with generator (CONTRACTOR) name.
- B. There is no permitted landfill in the community. Contractor shall be responsible for collection, removal, and disposal of all construction materials, debris, and rubbish from site, in accordance with all Federal, State and local regulations.
- C. Contractor shall dispose of hazardous materials such as mineral spirits, oil, chemicals, or paint thinner in accordance with all federal, state, and local requirements. Provide acceptable containers for collection and disposal of waste materials, debris and rubbish.

3.5 REMOVAL OF TEMPORARY FACILITIES

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 01568
EROSION CONTROL

PART 1- GENERAL

1.01 RELATED REQUIREMENTS

- A. General Conditions and Supplementary Conditions
- B. Division 2 Specifications
- C. Requirements of Federal, State, and local statutes and regulations dealing with storm water, pollution and erosion shall be strictly adhered to by the Contractor.

1.02 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.

1.03 ENVIRONMENTAL PROTECTION

- A. 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.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 EROSION CONTROL

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

END OF SECTION

SECTION 01569

CONSTRUCTION CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Cleaning and disposal of waste materials, debris, and rubbish during construction.

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Article 6, CONTRACTOR's Responsibilities - Materials and Equipment, and Maintenance During Construction.
- B. Section 01700 - Contract Closeout: Final Cleaning
- C. Individual Specifications Sections: Specific cleaning for Product or Work.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Provide containers for deposit of waste materials, debris, and rubbish.

PART 3 - EXECUTION

3.01 GENERAL CLEANING

- A. Maintain areas under CONTRACTOR's control free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

3.02 DISPOSAL

- A. Collect and remove waste materials, debris, and rubbish from site periodically and dispose of in accordance with all Federal, State and local regulations.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Section 01090 – Reference Standards.
- B. Section 01400 – Quality Control: Submittal of manufacturers' certificates.

1.03 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.

1.04 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.

1.05 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 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. CONTRACTOR's options in selection of products.
- B. Products list.
- C. Requests for substitution of products.

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Article 6, Substitutes or "Or-Equal" Items.
- B. Document 00800 - Supplementary Conditions: Substitutions
- C. Section 01010 - Summary of Work: Coordination of Construction.
- D. Section 01340 - Shop Drawings, Product Data, and Samples: Product Data Submittals.
- E. Section 01701 - Contract Closeout Procedures: Project Record Documents.

1.03 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.

1.04 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.

1.05 PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, transmit four copies 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.

1.06 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 determine acceptability of substitutions.

1.07 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 01340.
- D. List similar projects using product, dates of installation, and names of design Engineer(s) and 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.

1.08 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.

1.09 SUBMITTAL PROCEDURES

- A. Submit five copies of complete request for substitution.
- B. AUTHORITY 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 01340.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Section 00700 - General Conditions: Fiscal provisions, legal submittals, and other administrative requirements.
- B. Section 01720 – Project Record Documents

1.03 CLOSEOUT PROCEDURES

- A. Comply with Section 01701 – Contract Closeout Procedures.

1.04 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.

1.05 ADJUSTING

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

1.06 PROJECT RECORD DOCUMENTS

- A. Comply fully with the requirements of Section 01720 – Project Record Documents.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.
- B. Deliver to project site and place in location as directed, obtain receipt prior to final payment.

1.08 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.
- D. 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.

1.09 OPERATIONS AND MAINTENANCE (O&M MANUALS)

- A. Provide four O&M Manuals.

- B. Submit data in bound 8-1/2 x 11 inch text pages, ring binders with durable plastic covers.
- 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.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01701

CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Administrative provisions for Substantial Completion and for Final Acceptance.

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Fiscal provisions, and additional administrative requirements.
- B. Section 01010 - Summary of Work.

1.03 SUBSTANTIAL COMPLETION SUBMITTALS

Submit the following prior to requesting a Substantial Completion Inspection:

- A. Project Record Documents: Under provisions of Section 01700.
- B. Operation and Maintenance Data (O&M Manual): Under provisions of Section 01700.
- C. Spare Parts and Maintenance Materials: Under provisions of Section 01700.

1.04 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 promptly 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.

1.05 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.

1.06 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.

1.07 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Under provisions of Section 01700.
- B. Warranties and Bonds: Under provisions of Section 01700.
- C. Operations and Maintenance Manuals: Under provisions of Section 01700.
- D. Evidence of Payment: In accordance with Conditions of the Contract.
- E. Consent of Surety to Final Payment.
- F. Certificate of Release.

1.08 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.
- C. See Section - 01370.1.04.F for minimum value for Contract Closeout Submittals.

1.09 APPLICATION FOR FINAL PAYMENT

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

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Document 00700 - General Conditions: Record Documents.
- B. Section 01010 - Summary of Work: Record survey.
- C. Section 01340 – Shop Drawings, Product Data, and Samples.
- D. Section 01701 - Contract Closeout Procedures.
- E. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. In addition to requirements in General Conditions, maintain at the site for AUTHORITY 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 01720.1.03.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 the AUTHORITY and at time of each Application for Payment submit complete collection of record documents to the 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.

1.04 RECORDING

- A. Record information on a set of full size (22"x34") line opaque Drawings, and in a copy of a Project manual, provided by AUTHORITY.
- 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.

1.05 SUBMITTALS

- A. Upon submittal of the completed Record Documents, make changes in Record Documents as required by the 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 02010

SUBSURFACE CONDITIONS

PART 1 – GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 02200 - Excavation and Embankment

1.02 SOIL REPORTS

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. 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.
3. 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.

END OF SECTION

SECTION 02084

EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Procedures to be followed if contaminated soils are encountered during execution of the Work required by the Contract documents.

1.02 REFERENCES

- A. 18 ACC 75 Article 3 Discharge, Reporting, Cleanup, & Disposal of Oil and other Hazardous Substances.
- B. 18 AAC 75 Section 370 Soil Storage.
- C. 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response

1.03 DESCRIPTION OF WORK

- A. Contractor shall immediately notify Engineer if contaminated soils are encountered.
- B. Contractor shall stop all work and wait for instruction from the Engineer or Engineer before proceeding.
- C. All work related to excavation and handling of contaminated soils is considered out of scope and shall be negotiated with the Authority based on the site conditions, extent of contamination, and action needed.
- D. Contractor may be required to independently contract an environmental specialist experienced in dealing with contaminated sites. This specialist will develop a plan for handling contamination that will be approved by the Authority and by the Alaska Department of Environmental Conservation. Environmental specialist must be approved by the Authority prior to contracting the work.
- E. Contractor is responsible for contamination that results from his own work or operations.
- F. This specification is applicable to pre-existing contaminated soils.

PART 2 – MATERIALS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 02100

CLEARING & GRUBBING

PART 1 – GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

- A. Section 02140 - Dewatering and Control of Surface Water
- B. Section 02200 - Excavation and Embankment

1.03 DEFINITIONS

- A. Clearing: Includes cutting and disposing of all brush, trees and stumps, to within 6 inches of natural ground. 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 – MATERIALS

Not used.

PART 3 – EXECUTION

3.01 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 Engineer.
 - 1. Locate, identify and protect utilities from damage.
 - 2. Verify with the Owner any vegetation to remain.

3.02 PROTECTION

- A. Provide protection as necessary to prevent damage to existing improvements and utilities indicated to remain.
- B. Protect improvements on adjoining properties and on project site.
- C. Protect trees, plant growth and features designated to remain.

- D. Protect survey benchmarks, property corners, survey monuments and existing work from damage or displacement.
- E. 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.

3.03 USE AND DISPOSAL OF GRUBBED MATERIAL

- 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 located on private land, 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 the Authority, its employees, agents, or engineers liable for use of 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 02140

DEWATERING AND CONTROL OF SURFACE WATER

PART 1 – GENERAL

1.01 SCOPE OF WORK

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

1.02 SYSTEM DESCRIPTION

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

PART 2 – MATERIALS

2.01 GENERAL

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

PART 3 – EXECUTION

3.01 GENERAL

- A. The construction area shall be maintained in a relatively dry condition during the placement of fill materials.
- B. Remove ponded water and limit water flowing or infiltrating into the work area to the extent that the quality of work is not compromised.
- C. 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.
- D. Discharge from dewatering operations shall be returned to natural drainage routes. Settling pits, silt fences, straw dikes, or other appropriate measures shall be utilized to prevent highly turbid waters from entering existing ponds, streams, or wetlands.

END OF SECTION

SECTION 02200

EXCAVATION AND EMBANKMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements for all types of earthwork and is applicable to all earth work required on the Project.

1.02 RELATED REQUIREMENTS

- A. Division 1 Specifications
- B. Section 02010 - Subsurface Conditions
- C. Section 02275 - Geotextile Fabric and Geomembrane Liner

1.03 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 Engineer approved, certified, independent soils testing laboratory and field personnel for all required testing.
 - 2. Provide certified test results as required in Section 1.04, Submittals.
 - 3. Fill material placed or covered prior to Engineer's 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: One (1) gradation analysis and one (1) moisture/density (compaction curve) test samples shall be taken at each Classified Fill material source to be used in the work, and report of test results shall be submitted to the Engineer.
- b. If the Contractor changes the source and/or stockpile from which materials are obtained or 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, one (1) additional gradation analysis and one (1) moisture/density (compaction curve) test samples shall be taken, and report of test results shall be submitted to the Engineer.
- 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 born by the Contractor.

1.04 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 subconsultant.

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 Engineer.
 5. Results of all in-place density field tests.
 6. Catalog and manufacturer's data sheets for proposed compaction equipment.
 7. Borrow pit excavation plan indicating proposed areas of excavation.
 8. 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 Authority.
 2. During construction, the Authority 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 Authority. 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.

1.06 MATERIAL SOURCES

There are several local, privately held gravel pits, including:

1. Mental Health Trust Land QCD 8200063 DOC # 2013-001330-0 K.R.D.
2. Forest Service Pit
3. Local Contractor-Owned Pit (Pat Richter)

Contractor shall be responsible for procuring and transporting all classified fill required for this project. The contractor shall coordinate as necessary with the pit owner, 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 and processing.

PART 2 – PRODUCTS

2.01 CLASSIFIED FILL MATERIALS

Classified fill and backfill shall meet the requirements for Type I, Type II, and Type III listed below. Classified fill shall contain no lumps, frozen material, organic material, muck, peat, vegetation, debris or other unsuitable or deleterious matter, and shall be durable and sound. It shall have a plasticity index not greater than six (6) as determined by ASTM D-535 and shall conform to one of the following types as required by the Drawings and Specifications. The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131.

The portion of the material retained on the #4 sieve shall be known as coarse aggregate. Both coarse and fine aggregates shall conform to the quality requirements of AASHTO M-147.

A. Type I Fill Material:

Materials furnished by the Contractor for use at Type I classified fill and/or backfill shall be graded with the limitations delineated below:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
4 inch	100
3 inch	60-100
No. 4	10-20
No. 200	0-10

B. Type II Fill Material:

Materials furnished by the Contractor for use at Type II classified fill and/or backfill shall be graded with the limitations delineated below:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
1 inch	100
3/8 inch	60-100
No. 4	40-85
No. 200	0-6

C. Type III Fill Material:

Materials furnished by the Contractor for use at Type III classified fill and/or backfill shall be graded with the limitations delineated below:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing, by Weight</u>
18 inch	100
12 inch	40-60
6 inch	10-20
1 inch	0

PART 3 – EXECUTION

3.01 GENERAL

- A. Notify Engineer of any discrepancies between Contractual requirements and site conditions prior to start of Work.
- B. Contractor shall locate all existing underground utilities in the vicinity prior to excavation.
- C. Carefully layout work to minimize disruption to existing surfaces.
- D. 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.
- E. 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.
- F. All work shall be performed in accordance with OSHA requirements.
- G. Barricade open excavations to prohibit public entry.
- H. 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 Engineer.
- I. Any work covered up prior to test completion and achieving testing requirements or Engineer's approval shall be excavated and reconstructed at Contractor's expense.
- J. Work in inclement weather at Contractor's risk.
- K. 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.

- L. 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.
- M. 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.
- N. No separate payment for any excavation shall be made. All excavation shall be incidental to the Bid Item being performed.

3.02 EXCAVATION

- A. Excavate to lines and grades shown on the Contract Drawings.
- 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 outside of the work area. Contractor shall make arrangements for the disposal of the excavated material and bear 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. Unauthorized Excavation:
 - 1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or neat-line dimensions without written direction by the Engineer.
 - 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.

3.03 SITE PREPARATION

- A. Clear and grub the construction area in accordance with Section 02100 of the Specifications and the Contract Drawings.
- B. Tank farm project area must be fully thawed (no seasonal frost) prior to placement of fill.

- 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; leaving the surface smooth and even.
- D. 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.
- E. 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.

3.05 EMBANKMENT CONSTRUCTION

- A. Construct embankments using classified fill material as shown on the Contract Drawings.
- B. Borrow Pit Operation
 - 1. All borrow pits shall be kept neat and orderly. Work pits in a systematic manner. Keep borrow pits graded to drain and take all necessary precautions to minimize erosion. Maintain access roads as necessary at Contractor's expense. Excavation at the borrow pits shall be limited to the depth which will permit the area to drain to the surrounding area at the completion of work.
- C. 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 twelve (12) inches in loose thickness. The Engineer 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 3.06 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 Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

3.06 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 or to the "Maximum Attainable Density" as determined by the Engineer in the field.
- B. "Maximum Attainable Density" shall only be used with the written approval of the Engineer.
- C. Correct improperly compacted areas or lifts if soil density tests indicate inadequate compaction.
- D. 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.
- E. If, in the opinion of the Engineer, 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 Engineer until specified density is obtained, at no additional cost to the Authority.
- F. 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.

3.07 GRADING

- A. Existing ground contours shown on the Contract Drawings are based upon limited design 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.

3.08 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 Engineer.

- 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.

3.10 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 02222

TRENCHING AND BACKFILL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This section describes general requirements for trenching and backfill operations.

1.02 RELATED REQUIREMENTS

- A. Section 02084 - Excavation and Handling of Contaminated Material
- B. Section 02200 - Excavation and Embankment
- C. Section 15191 - Fuel Piping System
- D. Section 16110 - Conduits and Fittings

1.03 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 Engineer of unexpected sub-surface conditions.
- 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.

1.04 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 Authority, 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 Engineer, 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 100 lineal feet of trench. (Minimum of one test per lift regardless of trench length.)

1.05 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 Engineer.
- D. Cost of testing shall be incidental to bid item and no separate payment shall be made.

PART 2 – MATERIALS

2.01 TRENCH BACKFILL

- A. Material for trench backfill shall be Engineer approved fill 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 Contractor shall furnish Classified Fill material.

2.02 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: Fuel 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

3.01 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.

3.02 EXCAVATION

- A. Cut trenches sufficiently wide to enable proper installation and inspection of utilities as specified and shown on the Contract Drawings.
- B. Remove and dispose of all organic material and debris from trench excavation.
- C. Correct unauthorized excavation or over-excavated areas at no cost to the Authority.
- D. If the excavation encounters contaminated soils proceed in accordance with Section 02084 Excavation and Handling of Contaminated Material.

3.03 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 the 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.

3.04 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 02220 Excavation and Embankment, 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 Authority.

3.05 FIELD QUALITY CONTROL

- A. Notify the Engineer 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 02275

GEOTEXTILES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This section describes general requirements for furnishing and installing geotextile fabrics, geogrid tiebacks, and geomembrane liners, as shown on contract drawings.

1.02 RELATED REQUIREMENTS

- A. Section 02200 - Excavation and Embankment

1.03 SUBMITTALS

- A. General: Conform to Section 01340, Shop Drawings, Product Data and Samples.
- B. Furnish Manufacturer's Information and design data, including complete product installation instruction.

1.04 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Conform to Section 01600, Material and Equipment.
- B. Packaging and Identification Requirements:
 - 1. Geotextile rolls and folded geomembrane bundles 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.

1.05 QUALITY ASSURANCE

- A. Manufacturer: The manufacturer of the geotextile, geogrid, and geomembrane 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 a manufacturer's certificate prior to shipment.
 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. Weather Limitations: All work shall be performed under weather conditions recommended by the manufacturer.

PART 2 – MATERIALS

2.01 GEOTEXTILE FABRIC

- A. 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.

B. Geomembrane Liner

1. The geomembrane liner shall be 23-oz per square yard black, 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.

SPECIFICATION PROPERTY	TEST LIMIT	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

2. Geomembrane liners shall be ordered as one piece units. Seams shall be factory welded and certified prior to shipment. Field seams are not allowed.
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.
9. Acceptable Brands
 - a. Cooley L1023DEP

2.02 GEOGRID

A. Geogrid Retaining Wall Tieback

1. The geogrid tieback shall be composed of high molecular weight, high tenacity polyester multifilament yarns, which are woven in tension and finished with a PVC coating which meets or exceeds the physical properties of Tencate Mirafi Miragrid 10XT. Liner shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids and conform to the following table:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Tensile Strength (at ultimate)	ASTM D6637	lbs/ft	9500
Tensile Strength (at 5% strain)	ASTM D6637	lbs/ft	3120
Creep Reduced Strength	ASTM D5262	lbs/ft	6013
Long Term Allowable Design Load	GRI GG-4(b)	lbs/ft	5206

2. Geogrid shall be protected and crated to prevent any damage during shipping.
3. Install geogrid in accordance with manufacturer's instruction.
4. Acceptable Brands:
 - a. Tencate Mirafi Miragrid 10XT

PART 3 – EXECUTION

3.01 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. When necessary, overlaps shall be 3' minimum at all joints.
3. Construction vehicles will not be allowed to travel directly on the fabric.

4. Take due care to ensure that fabric is not damaged during construction activities.
 5. Fabric damaged to a degree that compromises its intended capabilities shall be replaced with same approved geotextile fabric at no additional cost to the Authority.
- C. If the geotextile becomes torn or damaged, it shall be repaired at the Contractor's expense prior to backfill operations.
- D. The fill material shall be cleaned from the surface of the geotextile and the torn area overlain with new fabric, providing a minimum of 24 inches of overlap around the edges of the torn area. Care shall be taken that the patch remains in place during subsequent fill placement.

3.02 INSTALLATION OF GEOMEMBRANE LINER

- A. Geomembrane Liner Installation
1. Position folded geomembrane bundle on top of non-woven geotextile fabric within tank farm area in accordance with unfolding map to be provided by the manufacturer.
 2. Only those liners which can be anchored and installed during the same day shall be unpacked and placed into position.
 3. Begin installation on the upwind side of the project and proceed in the downwind direction whenever possible. The leading edge of the liner shall be secured at all times with sandbags sufficient to hold it down during high winds.
 4. After geomembrane liner is unfolded and in place, install non-woven geotextile over membrane in accordance with the Contract Drawings.
- B. Any repairs made to the geomembrane liner shall be patched with the lining material and shall be performed by a qualified manufacturer representative in accordance with manufacturer instructions.
- C. 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 the Authority or if the repair is not covered under the manufacturer's warranty then the Contractor shall remove the damaged liner and provide and install a new liner in place of the damaged one at no additional cost to the project.

3.03 FILL PLACEMENT

- A. Fill or backfill placement shall be in accordance with Section 02200 Excavation and Embankment.

- 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.

END OF SECTION

SECTION 02830
CHAINLINK FENCE AND GATES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This section describes the general requirements for construction of fence and gates.

1.02 REFERENCES

Fence materials and installation shall conform to the chain link fence manufacturers institute standard specifications, except and modified herein.

1.03 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.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. 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.

1.05 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 Engineer, prior to submittal of product description and information for acceptance, whenever possible.
- B. Fence materials and installation shall conform to the chainlink fence manufacturer's institute standard specifications except as modified here in.

1.06 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.

1.07 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 – MATERIALS

2.01 NEW FENCING MATERIALS, POSTS AND ACCESSORIES

A. Zinc-Coated Steel Wire Fabric:

1. Type 1, 2-inch mesh, 9 gauge, and 6-foot height.
2. Provide barbed and twisted selvage at top and bottom for all fabric.

B. Barbwire:

1. Provide 3 strands of 12.5 gage, 4 point Class III barbed wire over top of entire fence including gates.
2. Mount barbwire to straight Barbwire Arm Post Cap with eye; Hoover #CL-BAP-25S-OAE or approve equal.

C. Tension Wire for Top and Bottom of Fabric:

1. 7 gauge, coil spring steel Class III bottom tension wire.

D. Top Rail (Class 1, zinc-coated steel pipe, Grade A or B):

1. Minimum 18' long 1-5/8-inch diameter full-weight pipe top rails with 6-inch long couplings.

E. Posts and Braces (Class 1, zinc-coated steel pipe, Grade A or B):

1. Line Posts: 2-3/8-inch O.D. X 10-foot long and weight of 3.12 lb/ft.
2. Man Gate, End, Corner and Pull Posts: 2-7/8-inch O.D. X 12-foot long and weight of 4.64 lb/ft.
3. Max spacing of Pull Posts is 75 feet.
4. Each Pull Post shall be supported with a diagonal Brace Rail to the adjacent Line Post.
5. Post Brace Rail: 1-5/8-inch O.D. and weight of 1.84 lb/ft; and 3/8-inch truss rods with tighteners for each terminal post.

F. Man Gates:

1. Size and type shown on Drawings.
2. Gates shall be constructed so that they may be operated by one person.
3. 1-7/8-inch diameter commercial quality (CQ-20) gate frames complete with locking frost-free latches, stops, keepers, and heavy pattern post and gate frame hinges.
4. Gate sections 6 feet wide and wider shall have either intermediate members and/or diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.
5. Gate sections less than 6 feet wide shall have truss rods and/or intermediate braces.
6. Gate fabric shall be the same design and height of line fence fabric; furnished with twisted selvage top and bottom.
7. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted.
8. All hardware shall be zinc-coated.
9. Latches and other gate appurtenances shall be of sufficient strength and design to assure easy, trouble free operation.
10. Latches:
 - a. Latches shall be plunger bar type of full gate height with positive locking gravity mechanism to secure the gate.
 - b. Latches shall be arranged for pad-locking so that the padlock will be accessible from both sides of gates.

G. Cantilever Gate:

1. Size gate components as shown on the Contract Drawings
2. Gate shall be constructed so that it may be operated by one person.
3. Vertical, horizontal and brace members shall be galvanized pipe complying with ASTM F1043 Group IC galvanized steel pipe.
4. Gate frame fabricated by welding.
5. Internal Roller Design
 - i. Cantilever gate to comply with the performance deflection criteria listed in ASTM F1184.
 - ii. Gate designed to open or close by applying an initial pull force no greater than 40 lbs.
6. Match chain link fabric to that of the fence system.

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

1. Provide heavy-pressed steel or malleable fittings for all attachments.
2. Tension/Stretch bars: 3/16-inch x 3/4-inch flat bar

3. Tension bar bands: 1/8-inch x 1-inch with 3/8-inch carriage bolt.
 4. Wire Ties and Clips: 9 gauge.
 5. Truss Rods: 3/8-inch diameter.
- I. Zinc Coating:
- 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

3.01 GENERAL

- A. Install posts, fabric, gates and accessories in accordance with the chain link fence manufacturer's institute standard specification and the manufacturer's instructions.
- B. Repair damaged galvanized surfaces with an approved cold galvanizing compound in accordance with manufacturer's instructions.

3.02 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. Wrap buried portions of posts with three (3) wraps of greased, 10 mil visqueen prior to backfilling.
 3. Install posts in concrete where indicated on drawings.
- 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 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.

3.03 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 12 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.

3.04 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 line posts.
- D. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal.

3.05 TOP RAIL AND TENSION WIRES

- A. Pass top rail through line post tops and join rail sections with sleeve couplings. Fasten top rail to terminal posts with pressed steel fittings.
- B. Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence.
- 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.

3.06 GATES

- A. Install gate frame plumb with tops of posts level with each other.
- B. Set socket for the cane or foot bolt as shown on the Contract Drawings.

3.07 INTERMEDIATE CLIPS

- A. Intermediate clips shall be installed on fence sections attached to the concrete containment wall as shown on the drawings.

END OF SECTION

SECTION 02890

SIGNS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the furnishing and installation of signs at the bulk tank farm, dispensing areas, and truck header.
- B. The Contractor shall furnish all signs and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 01300 - Submittals
- B. Section 02830 – Chain Link Fence and Gates

1.03 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”.

1.04 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.
- C. Submit one (1) sample for approval of each type of fastener used to install, hang or otherwise fasten signs.

PART 2 – MATERIALS

2.01 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 220 High Performance vinyl background as indicated on the Contract Drawings, or as appropriate for the application, as manufactured by Warning Lights of Alaska or approved equal.

2.02 SIGNS

- A. Provide signs as indicated on the Contract Drawings

PART 3 – EXECUTION

3.01 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 9 gage steel hog rings or steel wire ties.

END OF SECTION

SECTION 02930

SEEDING

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 Specifications
- B. Section 02200 - Excavation and Embankment

1.02 SUBMITTALS

- A. A statement signed by the vendor certifying that each lot of seed has been tested by a recognized seed testing laboratory within 6 months before the date of delivery to the Project.
- B. Certification from grower certifying grass species.

1.03 SCOPE OF WORK

- A. Areas grassed and/or seeded prior to construction and excavated or otherwise disturbed during construction operations shall be restored to their original condition.
- B. The following areas shall be seeded in accordance with this section:
 - 1. Previously vegetated areas of local material sources.
 - 2. Roadway sideslopes, including that for any haul roads to remain after construction activities.
 - 3. Previously vegetated areas disturbed by construction activities.
 - 4. All other areas defined on the Contract Drawings.

1.04 REFERENCE

- A. Roadway Seeding - Refer to "A Revegetative Guide for Conservation Use in Alaska," May 1991, published by Cooperative Extension Service of the University of Alaska Fairbanks.

PART 2 – PRODUCTS

2.01 SEED

- A. Grass seed of the type hereinafter specified shall conform to the standards of State Department of Agriculture.

- B. Seed shall be furnished in standard containers on which shall be shown the following information:
 - 1. Common name of seed
 - 2. Lot number
 - 3. Net weight
 - 4. Percentage of purity
 - 5. Percentage of germination (in case of legumes percentage of germination to include hard seed)
 - 6. Percentage of weed seed content and inert material clearly marked for each kind of seed in accordance with applicable state and federal laws.
- C. Grass Seed Mix and Application Rates (broadcast method):
 - 1. Procure and apply a seed mix approved for the Edna Bay Region by the Alaska Division of Agriculture; Plant Materials Center

2.02 FERTILIZER

- A. General:
 - 1. Fertilizer shall be a standard commercial grade of organic or inorganic fertilizer of the kind and quality specified herein. It may be separate or in a mixture containing the percentage of total nitrogen, available phosphoric acid, and water-soluble potash in the amounts specified.
 - 2. All fertilizers shall be furnished in standard unopened containers with weight, name of plant nutrients, and manufacturer's guaranteed statement of analysis clearly marked in accordance with state and federal laws.
 - 3. Fertilizer shall be ground to a fineness as required for the method of application.
- B. Fertilizer Analysis and Application Rates:
 - 1. Total Nitrogen: 60 lbs per acre
 - 2. Available Phosphoric Acid: 100 lbs per acre
 - 3. Water Soluble Potash: 50 lbs per acre

PART 3 – EXECUTION

3.01 GRASS SEEDING

- A. Seeding shall be performed as soon as practicable after ground disturbing activities.
- B. Seeding shall not be performed during windy weather or when the ground is frozen, excessively wet or otherwise untillable.
- C. Seedbed Preparation:
 - 1. Sideslopes shall be no steeper than 2 horizontal to 1 vertical and shall be compacted and tracked by a dozer to reduce erosion.
 - 2. The tracked ground surface shall be covered with an erosion control blanket (North American Green S75, or approved equal) in accordance with the manufacturer's recommendations.
- D. Grass seed shall be applied at the rates specified above.
- E. Fertilizer shall be applied at the rates specified above.
- F. Seeding Time:
 - 1. The exact time for seeding will be determined by actual weather conditions.
 - 2. The normal satisfactory period for seeding shall be considered between May 15 and July 15 unless otherwise authorized by the Authority.
- G. When weather conditions are such that satisfactory results are not likely to be obtained for any stage of the seeding operations, the Contractor shall stop the work and it shall be resumed only when the desired results are likely to be obtained or when approved alternates or corrective measures and procedures are adopted.
- H. The Contractor shall protect all seeded areas from erosion until final inspection and acceptance has been made and until such time as grass leaves are visible to the eye.
- I. Areas damaged by erosion shall be repaired by the Contractor at his own expense.

3.02 WATERING

- A. Duration:
 - 1. The Contractor shall water all seeded areas a minimum of three times each week or often enough to maintain a moist seed bed to promote

healthy seed germination, whichever provides the greater watering frequency, for a duration of 30 days.

2. Watering shall cease at first hard frost in the Fall and shall resume upon ground thaw the following Spring.
 3. If at any time during the maintenance period weather conditions (such as extended period with no rain or continuous drying winds) cause the root zone to dry out, the Engineer may direct the Contractor to water all seeded areas.
 4. Any supplemental watering shall be done immediately at no additional cost the Owner.
- B. Water application shall be applied at a rate that will provide moisture penetration throughout the entire root zone with a minimum of water run-off and no erosion.
- C. Should soil conditions be encountered not conducive to water absorption, the Contractor shall take whatever corrective actions that may be required to correct this condition, without additional cost the Owner.

3.03 FINAL INSPECTION

- A. Final inspection for seeded areas shall not be made until 30 days following completion of all seeding and fertilizing as specified.
- B. Damage caused by the Contractor to areas which have been seeded shall be repaired and/or replaced by the Contractor at his own expense.

3.04 GUARANTEE

- A. Guarantee of planting and seeding shall continue for one year from date of final acceptance.
- B. Contractor shall replace all seeded areas as required during the guarantee period.
- C. Guarantee shall include both materials and labor.
- D. Replacements shall be the same as originally planted.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED REQUIREMENTS

- A. Contract Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Air-entraining admixture
 - 2. Water reducing admixture
 - 3. Concrete joint sealer
- B. Design Mixtures: Submit mix design. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Provide 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.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Contractor shall provide an independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. 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.
- B. 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.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending, damage and excessive corrosion.

PART 2 – MATERIALS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces.
 1. Plywood, metal, or other approved panel materials.
- B. 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.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 installed in accordance with ACI 318.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

2.04 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 or III.
- B. Aggregates: ASTM C 33. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Corrosion Inhibitor: Master Builders Rheocrete 222, or approved equal.

2.06 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.

2.07 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 1.5 percent at point of delivery.
- C. Use accelerating admixtures in cold weather only when approved by the Engineer. If approved, use of admixtures will not relax cold weather placement requirements.

2.08 FABRICATING REINFORCEMENT

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

2.09 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.

2.10 CONCRETE ANCHOR ADHESIVE

- A. 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

3.01 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 forms tight enough to prevent loss of concrete mortar.
- 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.

3.02 REMOVING AND REUSING FORMS

- A. General: Formwork 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 Engineer.
- 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.

3.03 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.
 - 1. 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.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

3.04 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.

3.05 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.

3.06 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer'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 Engineer.

3.07 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor shall 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 Engineer, 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 Engineer 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 Engineer. 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 Engineer.

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 03410

PRE-CAST CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes pre-cast concrete blocks for containment dikes and above-ground storage tank foundations as shown in the drawings

1.03 SUBMITTALS

- A. Pre-cast Fabricator, statement of qualifications.
- B. Product Data:
 - 1. Air-entrainment admixture.
 - 2. Water reducing admixture.
 - 3. Liquid chemical sealer-hardener compound.
- C. Design Mixes: Submit proposed mix design, stamped by a engineer licensed in the State of Alaska, for each class of concrete for review prior to commencement of Work.
- D. Submit results of cylinder breaks, entrained air tests and slump tests.
- E. Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, openings, and types of reinforcement, including special reinforcement.
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Concrete materials.
 - 2. Reinforcing materials.
 - 3. Admixtures.

1.04 QUALITY ASSURANCE

- A. Pre-Cast Fabricator: Pre-cast fabricator shall be a company who fabricates pre-cast concrete units as a normal course of business with a minimum of 5 years

experience in this field. Submit statement of qualifications with past projects and references for approval.

- B. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
- C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."
- D. Acquire cement and aggregate from same source for all Work.
- E. Perform concrete reinforcing work in accordance with ACI Detailing Manual 315 and CRSI "Placing Reinforcing Bars".

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast structural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
- B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

PART 2 – PRODUCTS

2.01 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place according to CRSI's "Manual of Standard Practice," PCI MNL 116, and as follows:
 - 1. For uncoated reinforcement, use all-plastic bar supports.

2.02 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 4S.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Water-Reducing Admixture: ASTM C 494, Type A.

2.03 CONCRETE MIX DESIGN

- A. Prepare design mixes for each type of concrete required.
- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318 (ACI 318M).
- D. Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): Not less than 4500 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Air Entrainment is required in accordance with the 2003 International Building Code (IBC) Table 1904.2.1 for Severe Exposure, Frost Resistant concrete.
- E. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.04 FABRICATION

- A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.
 - 1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
- B. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- C. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.
- D. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
- E. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- F. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.
- G. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- H. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.
- I. Finish formed surfaces of precast structural concrete as indicated for each type of unit, and as follows:
1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
- J. Smooth steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

Install precast structural concrete. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.

3.03 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- 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, dispenser enclosures, truck fill areas, and other miscellaneous steel fabrications.

1.02 RELATED REQUIREMENTS

- A. Contract Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- 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 including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
- D. Welder's certifications.

1.04 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.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and re-lubricate before use.
 - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. At contractor's expense, repair or replace damaged materials or structures as directed.

PART 2 – MATERIALS

2.01 PRODUCTS

- A. 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.
- B. Structural Steel Shapes, Plates, and Bars: ASTM A36
- C. Structural Tubing: A500

- D. Unfinished Threaded Fasteners: ASTM A325, Grade A, regular low-carbon steel bolts and nuts.
 - 1. Provide hexagonal heads and nuts for all connections.
- E. Electrodes for Welding: Use AWS 5.1 E70XX electrodes. Comply with AWS Code.

2.02 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 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.

2.03 STEEL COATING

- A. Miscellaneous Steel Structures
 - 1. Prime miscellaneous steel structures 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 primed miscellaneous steel structures 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.
- B. Coat miscellaneous steel structures in accordance with Section 15175 Aboveground Fuel Storage Tanks, Part 2.04 – Coating Systems, unless otherwise noted on Contract Drawings or Specifications.
 - C. Hot-dip Galvanizing: Provide hot-dipped galvanized coating where noted on the Drawings, 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 as noted in 3.01.E.
 - D. Paint or coat in accordance with the Specifications and Contract Drawings.

2.04 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 Engineer whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 – EXECUTION

3.01 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 Engineer. 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.

3.02 QUALITY CONTROL

- A. Authority may 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 06130

TIMBER CONSTRUCTION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes construction using timbers including, but not limited to, above ground pipe & conduit supports and Connex van foundation.

1.02 RELATED REQUIREMENTS

- B. Contract Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 DEFINITIONS

- A. Timbers: Lumber of 3 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.

1.04 SUBMITTALS

- A. Product Data: For timber.
 - 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, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
- B. Approval letters for fastener material selection from wood preservation and fastener manufacturer.

1.05 QUALITY ASSURANCE

- A. Timber Standard: Comply with AITC 108, "Standard for Heavy Timber Construction."

1.06 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 – MATERIALS

2.01 TIMBER, GENERAL

- 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. Timber Species and Grade: Hem-fir or hem-fir (North); No. 2 or better, NLGA, WCLIB, or WWPA.
- C. Preservative Treatment:
 - 1. Pressure treatment in accordance with AWPA standard C2, 0.60 minimum retention, rated for ground contact.
 - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Copper Azole – Type A (CBA-A).
 - b. Copper Azole – (CA-B)
 - c. Ammoniacal copper zinc arsenate (ACZA).
 - 3. Timber materials shall be treated with 0.41PCF of CBA-A or 0.21PCF of CA-B wood preservative.
 - 4. Use process that includes water-repellent treatment.
 - 5. Application: Treat all heavy timber construction, unless otherwise indicated.

2.02 TIMBER CONNECTORS

- A. 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.
- B. 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.

2.04 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

3.01 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 cut ends and bore holes in accordance with AWWA standard M4.

3.02 ADJUSTING AND CLEANING

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

END OF SECTION

SECTION 11951
SPILL RESPONSE EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes standard spill response equipment and Connex for storing this equipment.

1.02 RELATED REQUIREMENTS

- A. Section 01300 – Submittals
- B. Section 06130 - Timber Construction

1.03 REFERENCES

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

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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. Product substitutions must be approved by the Engineer.
- E. All equipment and materials shall be new unless indicated otherwise.

1.06 GENERAL

- A. Contractor is responsible for providing spill response equipment as specified and in accordance with this Section.
- B. Connex shall be placed on timber foundations in the locations indicated on the Contract Drawings.
- 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 Connex.
- F. Contractor shall finish the interior of the Connex to provide attendant kiosk and spill response equipment and storage as shown on the drawings.

PART 2 – MATERIALS

2.01 SPILL RESPONSE EQUIPMENT

- A. Provide all spill response equipment as specified in this Section or as noted on the Contract Drawings.
- B. Connex shall be standard 20-foot long shipping container, steel construction. Connex shall be in like new condition but need not be new. Connex doors shall operate freely without binding or excessive resistance. Connex exterior shall be painted same as tanks.
- C. Absorbent Material:
 - 1. Can be natural or synthetic.
 - 2. Shall repel water and absorb hydrocarbons only.
 - 3. Minimum hydrocarbon absorption rate shall be 0.23 gallons per square foot.
- D. Smart Ash incinerator shall be as specified, no substitutes.

2.02 SPILL RESPONSE EQUIPMENT

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: 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 3A-40BC
1 EA	Connex, 20 foot, lockable
10 EA	Padlocks, keyed-alike

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install connex on timber blocks as shown in drawings.
- B. Place spill response items in overpack drums. Construct shelving within connex for storage of any loose items. Shelving must be sufficiently strong to hold materials without deflecting.
- C. Connex shall be lockable.

END OF SECTION

SECTION 15175
ABOVEGROUND FUEL STORAGE TANKS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes requirements for furnishing and installing the following:
 - 1. One (1) twenty thousand (20,000) gallon, single wall, horizontal, steel, skid mounted aboveground storage tank for gasoline service – Outer tank dimensions shall be in accordance with Contract Drawings.
 - 2. One (1) twenty-eight thousand (28,000) gallon, single wall, dual compartment, horizontal, steel, skid mounted aboveground storage tank for diesel #1 and diesel #2 service – Outer tank dimensions shall be in accordance with Contract Drawings.
 - 3. One (1) five thousand (5,000) gallon, double wall, protected, dual compartment, horizontal, steel, skid mounted aboveground storage tank for diesel #2 and gasoline service – Outer tank dimensions shall be in accordance with Contract Drawings.
- B. All tanks shall be new and constructed in accordance with this Specification and the Contract Drawings, and shall be furnished with the fittings and appurtenances specified herein and/or shown on the drawings.
- C. The tanks shall, at a minimum, meet the requirements of the most current edition of Underwriters Laboratories Inc. (UL) Standard for Safety UL 142, “Steel Aboveground Tanks for Flammable and Combustible Liquids.” Protected tanks shall meet all requirements of the most current edition of UL 2085.
- D. All tanks must be UL listed and labeled horizontal tanks as indicated with welded head and shell joints.

1.02 RELATED REQUIREMENTS

- A. Section 01300 - Submittals
- B. Section 01340 - Shop Drawings, Product Data, and Samples
- C. Section 01700 - Contract Closeout
- D. Section 05120 - Structural Steel
- E. Section 15193 - Fuel Tank Appurtenances

1.03 REFERENCES

- A. The latest revision of the following standards of the American Society for Testing and Materials (ASTM), and other listed standards, are hereby made part of this

Specification. The publications may be referred to in the text by basic designation only.

- B. Reference to a particular organization's standards shall be in accordance with those standards unless more restrictive criteria is listed herein or on the Contract Drawings.
- C. Where Contract Drawings or Specifications call for material or construction of a better quality or larger sizes than required by the codes, rules and regulations listed below, the provisions of the Contract shall take precedence.

ASTM A 36	Standard Specification for Carbon Structural Steel
ASTM A 283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 570	Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
OSHA	Occupational Safety and Health Administration; Chapter 20, Fixed Ladders
UL 142	Steel Aboveground Tanks for Flammable and Combustible Liquids
UL 2085	Protected Aboveground Tanks for Flammable and Combustible Liquids

1.04 SUBMITTALS

- A. Submit material samples and manufacturer's literature in accordance with Section 01300 Submittals and Section 01340 Shop Drawings, Product Data, and Samples.
- B. Shop Drawings:
 - 1. Submit shop drawings, prior to fabrication, showing all principal dimensions of the tanks, details and locations of all accessories, penetrations and appurtenances, thickness of sheets and plates, details of joints and welds and description of coating system. All deviations from these Specifications and the Contract Drawings shall be clearly shown and identified on the shop drawings.
 - 2. Submit material lists with catalog cuts for any proposed substitutions.
- C. Packing Lists: The Contractor shall submit shipping packing lists, detailing all materials shipped and referencing the crate number each component is in. The packing lists will be provided to the Authority prior to the delivery date of the tanks.
- D. The Contractor shall submit the following for approval prior to the start of tank fabrication:
 - 1. Shop Drawings.
 - 2. Tank Painting Schedule – See Section 2.04.

- E. Work completed prior to receiving approved shop drawings is at the contractor's risk.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping and Handling:
 1. Packaging must meet the shipping requirements of all anticipated carriers and shall prevent abrasion, scratching or damage of the materials during overland transport and ocean barge shipment. Exterior ladders, catwalks and pipe supports shall be packaged and shipped separately from tanks. Packaging shall be sufficient to prevent damage during shipping. Extra care shall be taken to protect tank stand offs to ease field installation of bolt on components.
 2. All threaded tank openings shall be sealed for shipping with plastic or tin plugs. All flanged tank openings shall be blind flanged for shipment. Provide provision for relief of excess pressure/vacuum, which may damage the tank, while preventing precipitation or salt water spray from entering tank. Minimum vent opening shall be ½" diameter.
 3. Lifting connections shall be provided in accordance with the Drawings and as required for proper tank handling.
 4. Shipping crates shall be clearly labeled with community name and crate number in large, waterproof, lettering for easy identification at the construction site. Two (2) packing lists shall be securely attached to each shipping container (one inside and one outside) in watertight, re-sealable, plastic bags.
- B. Storage: The packaging shall provide adequate protection for the fabricated materials and appurtenances for outside storage at the site throughout the construction project.

1.06 QUALITY ASSURANCE

- A. Tank manufacturers shall have a minimum of 10 years experience including the manufacture of at least five similar tanks in the previous three years.
- B. Testing: Provide independent testing firm to perform testing and inspection for tank welding.
- C. Tank Leak Test: Provide tank integrity testing in the form of a hydrostatic test in accordance with UL 142.

1.07 DESIGN REQUIREMENTS

- A. General:
 1. Horizontal tank design criteria shall be in accordance with the current International Building Code, International Fire Code, the most current criteria of the American Society of Civil Engineers, and the most current Underwriters

Laboratories Inc. (UL) Standard for Safety UL 142, "Steel Aboveground Tanks for Flammable and Combustible Liquids":

- a. Specific Gravity = 1.0
 - b. Classification of Structure: Category IV, Essential Facility (ASCE/SEI 7-10 "Minimum Design Loads for Buildings and Other Structures").
 - c. Importance Factors (IBC 2009, ASCE 7)
 - i. Seismic = 1.5
 - ii. Snow = 1.20
 - iii. Wind = 1.15
 - d. Design Loading:
 - i. Seismic = Zone 3
S₁= 0.393
S_s= 0.516
 - ii. Ground Snow load = 50 PSF
 - iii. Wind = 120 MPH Exposure D
2. The tanks shall be designed, or supplemented, for anticipated shipping and handling loads. Lifting connections shall be provided where shown on the Drawings, and where required for shipping and handling. The lifting eyes shall be capable of fully supporting the static weight of the completed tank (empty) without damage to the tank.
 3. The tanks shall include the nozzles and fittings shown on the Contract Drawings. Provide water draw assemblies and clock gage stilling wells on all tanks as detailed on the Contract Drawings.
 4. Tank dimensions and capacity shall be as shown on the Contract Drawings.
 5. The Lowest One Day Average Temperature for Edna Bay is 31° F.

1.08 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 – MATERIALS

2.01 GENERAL

- A. Tank materials and appurtenances 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 NEW TANK IS PROHIBITED.

2.02 PRODUCTS

- A. Steel - Steel Sheets, Plates and shapes shall meet the requirements of Section 05120 Structural Steel of these Specifications.
- B. Threaded Penetrations – Threaded penetrations shall be female pipe thread, size as indicated.
- C. Flanged Penetrations – Flanged penetrations shall be class 150#, size as indicated.
- D. Gaskets - Gaskets shall be Buna-N.

2.03 TANKS AND APPURTENANCES

- A. Factory Coated welded steel fuel storage tanks:
 - 1. Tank Joints:
 - a. Head and shell joints for horizontal cylindrical tanks:
 - i. Primary tank head joints shall incorporate double welded full fillet lap joints in accordance with UL 142 Figure 6.2, No. 6,
 - ii. Secondary tank head joints shall incorporate single welded full fillet lap joints in accordance with UL 142 Figure 6.2 No. 4.
 - iii. Primary and secondary tank shell joints shall be double welded in accordance with UL 142 Figure 6.1 No. 1 or No. 2.
 - iv. Seams on the ends of all horizontal tanks shall be either vertical or horizontal. Skewed seams shall be cause for rejection of tanks.
 - 2. Horizontal Tank Ladders and Catwalks:
 - a. Equip horizontal tanks with exterior bolt on ladders and catwalks as shown on the Contract Drawings. All bolt on components shall be designed and constructed in accordance with federal OSHA, International Building Code, International Fire Code and UL 142 requirements.
 - b. Exterior ladder and catwalk components shall be shop assembled for field installation and hot dipped galvanized. Design shall permit field installation of exterior ladders and catwalks without field welding.
 - c. Verify fit of bolt-on ladder components to tanks prior to painting tanks; remove and package separately for shipping.
 - 3. Pipe/conduit standoffs:

- a. Equip tanks with all fittings, supports and appurtenances as shown on the Contract Drawings.
 - b. All components shall be designed and constructed in accordance with the Specifications and applicable Federal OSHA, International Building Code, the latest version of International Fire Code and UL 142 requirements.
4. Horizontal tank saddles and skids:
- a. All horizontal tanks to be provided with integral steel saddles and skid foundations in accordance with UL 142, Section 31 and the Contract Drawings.
 - b. Skids shall be suitable for skidding empty tanks without damage.
 - c. Provide minimum W8x35 skid foundations.
 - d. Skids to extend 12" beyond each end of tank assembly, be capped with a ½ inch thick end plate at 45 degree angle to horizontal, and be provided with 4" diameter Schedule 80 steel pipe tow bars at each end to allow dragging of the tank and lifting from one end with no damage to the tank assembly.
 - e. Saddles to be seal welded to tank - bolt on or strap on saddles will not be accepted. Space saddles as shown on the Contract Drawings. Maximum saddle spacing shall be 10 FT measured center to center.
 - f. Skid and saddles shall be constructed such that the vertical distance between the bottom of the tank skid and the bottom of the tank shell is no greater than 11 inches.
5. Tank Labeling
- a. All tanks shall be labeled in accordance with the requirements of the IFC Chapter 34 and NFPA 704. Each end of dual-compartment tanks shall be labeled for volume (gallons) and product type. All tank penetrations shall be labeled in accordance with the Contract Drawings in 2" high black lettering.

2.04 COATING SYSTEMS

A. Tanks and Appurtenances

1. All ladders, ladder cages, catwalks and railings shall be coated same as tanks.
2. The tank exterior, saddles, skids, fittings, nozzles, and standoff supports and pump and hose reel cabinets 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 nozzles, skids, pipe supports, fittings, etc.
 - b. Surfaces not coated: Flange and nozzle faces, penetration threads, flange and manhole bolts.

- c. Surface Preparation: All surfaces to be coated shall be prepared in accordance with the Structural Steel Painting Council SSPC-SP10, near white blast criteria.
- d. Coatings:
 - i. Prime Coat- Devoe Catha-Coat 302H inorganic zinc primer (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)
 - iv. Traction Coating: Provide slip resistant surface coating along top of tank(s) as shown on Contract Drawings. Slip resistant coating to consist of aluminum oxide aggregate (36 mesh size) mixed with top coat (Devthane 389) at a rate of 1 pound of aggregate per gallon of coating. Apply one coat of mixture by roller within 48 hours of final top coat application. Color same as top coat. Note: Omit traction coating where tank labels are to be applied. Area without traction coating should be no more than 1-inch larger than the label.
- e. Coat Colors: All coats shall be contrasting colors. Top coat color shall be white.
- f. 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.
- g. 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.

B. Coating Application

1. The Contractor shall submit to the Engineer, for his/her approval, the tank manufacturer's proposed painting schedule. At minimum, this shall include the spreading rate in square feet per gallon for each coat, minimum dry film thickness for each coat, application temperature, curing time and temperature, humidity limits, and paint and paint thinner to be used for the final coat. The painting schedule shall be in accordance with the paint manufacturer's recommendation and this specification, and shall be approved, in writing, by the Engineer prior to application.
2. If paint is diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted product. Deficiencies in film thickness shall be corrected by the application of an additional coat(s) of paint.
3. Inspection and Testing: The Engineer may be present during the coating process and may perform random tests. Any deficiencies identified during the inspection shall be corrected at the Contractor's expense.

PART 3 – EXECUTION

3.01 TANK PLACEMENT

- A. Install new aboveground storage tanks in accordance with the Contract Drawings, the referenced publications, and the manufacturer's written instructions, checklists, and warranty requirements for each system component.

3.02 COATING REPAIR

- A. Any damage to the factory-applied coating shall be repaired and restored to the original finish in strict compliance with the manufacturer's recommendations.

3.03 WARRANTY

- A. The Contractor shall warrant the tanks against any defects in workmanship and materials for a period of one year from the date of project substantial completion.
- B. In the event any such defect should occur, the Authority or Engineer shall report it in writing to the Contractor during the warranty period.

END OF SECTION

SECTION 15191

FUEL PIPING SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes requirements for fuel piping system materials, equipment, supports, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01300 - Submittals
- B. Section 01340 - Shop Drawings, Product Data, and Samples

1.03 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Rating: Unless otherwise indicated, minimum pressure requirement for fuel oil piping is 150 psig
- B. Design Service Conditions: All fuel tank appurtenances shall be rated for the following service conditions:
 - 1. Fluid; Gasoline and Diesel fuel
 - 2. Operating temperature range: 0 degree F to 120 degree F.
- C. Any reference standards that do not comply with these service conditions shall be brought to the Engineer's attention immediately.

1.04 REFERENCES

- A. The latest editions of the publications listed below form a part of this specification to the extent referenced.
- B. ASTM A333 Seamless and Welded Steel Pipe for Low-Temperature Service
 - 1. ASME B16.5 Flanges and Flanged Fittings
 - 2. ASME B16.9 Factory-Made Wrought Steel Butt welding Fittings
 - 3. ASME B16.11 Forged Fittings, Socket-Welding and Threaded
 - 4. ASME B31.3 Chemical Plant and Petroleum Refinery Piping
 - 5. ASME B31.4 Liquid Transportation Systems For Hydrocarbons and Other Liquids

6. ASME BPV IX Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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.
- E. Welding Procedure Qualification Records (PQRs) and Welding Procedure Specification.
- F. Pipe coating process and schedule.
- G. Inspection and Testing Procedures and Results.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Contractor is responsible for protection of all material, equipment, and apparatus provided from damage during transportation, storage and installation processes.
- B. Material, equipment or apparatus damaged because of improper storage or protection will be rejected and replaced at Contractor's expense.

PART 2 – MATERIALS

2.01 GENERAL

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

2.02 PIPE

- A. 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
- B. Pipe nipples: Type 304 stainless steel, threaded schedule to match adjoining piping.

- C. Buried Piping: Shall be schedule 80 and coated with thermoplastic resin extruded over an adhesive undercoat with a minimum coating thickness of 32 mils.
 - 1. Buried pipe coating: Shall be in accordance with NACE standard SP0185-2007 for polyethylene coating systems.
 - 2. Provide mastic lined heat shrink sleeve or tape for all pipe joints and fittings of the same thickness as the pipe coating as a minimum, Raychem WPC 100 M for pipe joints and Flexclad for fittings, or approved equal.
 - 3. Extend sleeves and wrap a minimum of 2 inches over pipe coatings.
 - 4. Prior to backfilling, test coating with an electronic holiday detector, repair all defects and retest.
- D. Cathodic Protection: Buried pipe shall be cathodically protected with pairs of sacrificial magnesium anodes installed at a maximum of 400-feet per pair or as indicated in Contract Drawings. Anodes shall be MAG-BAG 17# anodes with two 12 gauge wire leads. Cad weld leads to pipe.

2.03 PIPE FITTINGS

- A. Pipe fittings for 2-inch and larger piping: Seamless wrought carbon steel, meeting the requirements of ASTM A234. Flanges shall be ANSI B16.5 150-pound raised face, ASTM A105 forged steel weld neck type bored to match inside diameter of mating piping.
 - 1. Provide A320 Grade L7 galvanized or 316L stainless steel studs or bolts, nuts and washers for all flange connections, unless otherwise noted.
 - 2. Elbows shall be long radius, unless otherwise noted.
- B. Pipe fittings for welded pipe smaller than 2-inch: Forged carbon steel socket weld type, ASTM A105, 3000-pound minimum.
- C. Pipe fittings for threaded piping: Forged carbon steel, threaded type, ASTM A105, 3000-pound except where specifically noted.
- D. Flanges: ASME Class 150 raised face flanges, ASTM 105 forged steel. Bore shall match the pipe in which the flange is installed.
- E. Flange Gaskets: Gaskets shall be 1/8" thick spiral wound, stainless steel, filled fuel resistant gaskets rated for -50° F service with a carbon steel centering ring. Provide 1/8" thick full faced non-asbestos fiber composite gaskets and flat faced flanges where required for connection to equipment.
- F. Dielectric Flange Kits: Fuel rated full face fiber gaskets, with nylon bushings and washers. Calpico EQDW or approved equal.

- G. Flange nuts and studs shall be ASTM A320 Grade L7, plated, case hardened, and corrosion resistant.
- H. All pipe and fittings shall be Grade WPB, full penetration butt welded, schedule to match the piping in which fitting is installed.
- I. Threaded fittings are not allowed except where shown on the Contract Drawings, or where required for connection to equipment.
- J. Perform all welding in accordance with ASME section IX and API 1104 for welding procedure and performance qualification. Visually inspect weld joints in accordance with API 1104.
- K. Provide flanged connections as required to allow removal of individual components.

2.04 PIPE COATING SYSTEM

- A. Above Grade 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 4140, or approved equal, to 1.5 mils minimum dry film thickness. Color: Red.
 - 2. After field fabrication is complete, top coat primed pipe and fittings with two coats of alkyd enamel, Devoe Speed Enamel 4318, or approved equal. Color shall be red (ICI Color Code 9000 – Safety Red) for gasoline piping, yellow (ICI Color Code 8600 – Medium Yellow) for diesel #1 piping, and green (ICI Color Code 6650 – Medium Green) for diesel #2 piping.
 - 3. 2-inch length of each pipe to be left uncoated for welding. After welding, prepare and finish affected area per painting specification above.
 - 4. 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.
 - 5. Labels: After painting, 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 decal stickers. Maximum flow direction arrow spacing shall be 10 feet measured along pipe length, minimum of one arrow per pipe segment. Color for decals shall be black lettering on white background. Periodically label each pipe run, 50-foot minimum, 150 feet maximum.
- B. Below Grade Pipe: All buried piping shall be HDPE coated steel as noted in 2.02.

2.05 VALVES

- A. Flanged Gate Valves: Carbon steel body, ANSI 150# raised face flanged ends, flexible disc, steel trim, lockable handle 150 psig minimum working pressure. Crane Class 150, model 47, or approved equal.
- B. Swing Check Valves: (2" and larger) Carbon steel body, ANSI 150# raised face flanged ends, steel disc and trim, 150 psig minimum working pressure. Crane Class 150, model 147, or approved equal. (1") Bonney forge bolted bonnet full/reduced threaded swing check valve.
- C. Flanged Ball Valves: Reduced port carbon steel uni-body, ANSI150# raised face flanged ends, stainless steel ball and trim, glass filled Teflon seat, graphite seals, lockable handle, 150 psig minimum working pressure, compliant with NACE MR0175 Fire Safe and API 607. PBV model C-5410-31-2236-FT-NL, no substitutes. Provide all-weather padlock for each valve, all padlocks to be keyed alike for each Owner.
- D. Flanged Pressure Relief Valves: Steel body, ANSI 150# raised face flange inlet and outlet, 1/2" soft seat orifice, closed cap, size and pressure setting as indicated. Hydroseal 1FLAXV 00, or approved equal.
- E. Anti-Siphon Valves: Normally closed, bronze body, with special expansion relief set at 25 psig. Valve set to open at 20 feet head pressure. Morrison Bros Figure 910ER-7215AP with expansion relief, or approved equal.

2.06 EQUIPMENT NAMEPLATES AND OPERATIONAL TAGS

- A. 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.
- B. Color:
 - 1. Nameplates: White background with black lettering
 - 2. Operational Tags:
 - a. Diesel #1 components: Yellow background with black lettering.
 - b. Diesel #2 components: Apple Green background with black lettering.
 - c. Gasoline components: Red background with black lettering.
- C. 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 (e.g. BV-1, MV-3, etc), normal operating condition (normally open or closed), component owner and any additional information required for proper operation.

2.07 MISCELLANEOUS PIPING ACCESSORIES

- A. 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.
- B. Strainers: Carbon steel body, bottom clean-out Y-strainer with blow off tapping plug, ANSI 150-pound class raised face flanged ends. Provide #10 screen. 150 psig working pressure. Mueller Model 781, or approved equal.
- C. Flex Fittings: Type 304 stainless steel corrugated inner core with Type 304 stainless steel wire double braided outer cover, ASME Class 150 fixed flange by floating flange ends with 18" live length unless a different length is indicated. 150 psig minimum working, factory tested to 225 psig minimum. Provide factory test certification for each flex. Metraflex Metra-Mini, or approved equal.
- D. Fuel Filter - Two (2) cartridge in-line filter with Buna-N gasket and grommets, 1 1/2" 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.

2.08 PIPE SUPPORTS AND FASTENERS

- A. Support Strut: Cold formed mild steel channel strut, hot dipped galvanized finish and slotted back unless specifically indicated otherwise.
 1. Standard strut: 12 gauge, 1-5/8 inch by 1-5/8 inch, Unistrut P1000T (HG), or approved equal.
 2. Double strut: 12 gauge, 1-5/8 inch by 3-1/4 inch, Unistrut P1001T (HG), or approved equal.
 3. Shallow strut: 14 gauge, 1-5/8 inch by 13/16 inch, Unistrut P4100T (HG) or approved equal.
 4. Solid back strut (plain, unfinished black): For welding to tanks or structures, 12 gauge, 1-5/8 inch by 1-5/8 inch, unfinished black steel, Unistrut P1000 (PL), or approved equal.

- B. Fittings and Accessories: Provide galvanized or zinc plated carbon steel fitting, brackets, channel nuts and accessories designed specifically for use with supplied strut.
- C. Pipe Clamps: Galvanized carbon steel two-piece pipe clamp designed to support pipe tight to strut. Unistrut P-11## series or approved equal.
- D. Pipe Straps: Carbon steel two-hole pipe strap. Unistrut P2558, or approved equal.
- E. Fasteners:
 - 1. Bolts, nuts and washers: Galvanized or zinc plated carbon steel unless stainless steel is specifically shown. Stainless steel: Type 304.
 - 2. Lags: Hot dipped galvanized steel unless stainless steel is specifically shown. Stainless steel: Type 316
- F. Do not use Stainless Steel in contact with Galvanized items.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions as shown in the Contract Drawings.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and applicable codes and standards.
- B. Route piping in an orderly manner and maintain gradient.
- C. Group piping whenever practical at common elevations.
- D. 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.
- E. 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.

- F. Make threaded joints using pipe joint compound applied to the male threads. Hercules Grip, no substitution.
- G. Coat flange gaskets with anti-seize compound prior to assembly.
- H. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Provide dielectric flange kits at all transitions between aboveground and buried piping.
- I. Support piping and equipment as shown on the Contract Drawings using specified supports and fasteners. If not detailed on the Contract 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.

Pipe Size	Maximum Support spacing
1-1/2 inch	9 ft
2 inch	10 ft
2-1/2 inch	11 ft
3 inch	12 ft
4 inch	14 ft

- J. 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.
- K. Do not use stainless steel in contact with galvanized supports.
- L. Provide clearance for installation of insulation and access to valves and fittings.

3.03 EQUIPMENT NAMEPLATES AND OPERATIONAL TAGS

- A. Label contents of all Nameplates: Fasten nameplates on or adjacent to component with approved adhesive.
- B. Operational Tags: Fasten tags to components using metallic zip-ties, double safety wire, or other approved means.

3.04 TESTING

- A. 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.
- B. It is cautioned that air testing is hazardous in nature, as air is compressed and may be released explosively should the piping system rupture.
- C. Should water be used for testing, all water must be removed after the test.

- D. Contractor shall be responsible for protecting life and property during testing. Protect and isolate items that may be damaged by the test pressure.
- E. Prior to painting or concealing, test piping as follows:
1. Isolate and pressure test each run of piping with compressed air at 125 psig minimum pressure for a minimum of one hour. Provide blind flanges, threaded caps or plugs at each end of the test section as needed. Test 100% of welds visually for leaks with a leak detection solution. Do not conceal pipe joints before pressure testing is complete. Isolate equipment and components rated for lesser pressures.
 2. Pressure test piping system again after all equipment is installed at 75 psig for a minimum of one (1) hour, or the maximum rated pressure of the weakest component, whichever is less. Test 100% of welds and pipe joints for leaks with a leak detection solution. Piping system shall maintain pressure for one hour minimum.
 3. Notify Engineer in writing seven (7) days in advance of pressure tests. Engineer shall be present at all testing. Pressure testing performed without Engineer present will be rejected, unless prior written approval is received from Engineer.
 4. Pressure shall be maintained for sufficient time to complete the visual inspection of all joints but shall be not be less than one (1) hour.
 5. Care shall be taken to ensure that these pressures are not applied to vented tanks.
 6. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.
 7. Cut out, reweld and retest all leaking welded joints. Install new gaskets on any flanged joints that were taken apart.
 8. Repair any leakage found and retest until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
 9. After final system assembly, perform an additional leak test using fuel at 50 psig.
 10. Repair all defects.
 11. Certified test results shall be submitted to the Engineer for approval.
 12. Test certification shall include gauge pressure, air temperature, time, date, witness, and pipeline identification.

END OF SECTION

SECTION 15192
PUMPS AND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes requirements for fuel pumps and associated equipment.

1.02 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Rating: 150 psig
- B. Design Service Conditions:
 - 1. Fluid: Gasoline and Diesel fuel
 - 2. Operating temperature range: 0 degree F to 120 degree F.
- C. Any reference standards that do not comply with these service conditions shall be brought to the Engineer's attention immediately.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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.

PART 2 – MATERIALS

2.01 PUMPS

Submersible Pumps: Submersible explosion proof turbine pump with intake screen, integral leak detector specifically designed for pumping gasoline and diesel fuel, internal pressure relief and check valves. 208/230 VAC, single phase, 3/4 hp motor as shown on the Contract Drawings. Red Jacket Model P75S1-3/4HP with trapper intake screen, No substitutes.

2.02 RETAIL DISPENSING EQUIPMENT

- A. Mechanical two product retail dispenser: UL listed dual product dispenser for use with remote submersible pump. Mechanical registers displaying money per sale, gallons per sale, and price per gallon. Price per gallon register range shall be \$1.00/gallon to at least \$8.00/gallon. Non-resettable mechanical totalizer, lighted display, 100:1 pulser, 115 VAC/60 HZ powered. Provide internal 30 micron spin-

on filter and 10 spare elements. Dispenser shall be certifiable for retail sales. Prior to delivery, replace factory applied standard grease in mechanical register with a severe cold arctic-grade lubricant. Twin hose dual-product dispenser, Gasboy Atlas 8753KXTW2 – FIL, no substitutes.

- B. Retail Dispenser Arctic Hose: 3/4 inch diameter with 3/4 inch NPT connections at each end. Provide two 18 foot long sections of hose with retail dispenser. Goodyear Arctic Ortac or approved equal.
- C. Retail Dispensing Breakaway Connection: UL Listed 3/4 inch breakaway fitting. OPW 66V-0300 with 66H-0975 hose section or approved equal.
- D. Retail Dispensing Shear Valve: UL Listed 1-1/2 inch x 1-1/2 inch dispenser shear valve with fusible link. Morrison Bros Co. model 636F, or approved equal.
- E. Retail Dispensing Hose Swivel: UL Listed 3/4 inch NPT x 3/4 inch NPT swivel. OPW model no. 45M-5060, or approved equal.
- F. Retail Dispensing Hose Nozzle: UL listed automatic shut off, automotive fueling nozzle with hold open latch and color coded handle, red for gasoline and green for diesel #2. OPW 11BP-0300, and 11BP-0100, or approved equal.

2.03 BULK 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. Fleet Dispensing Facility Arctic Hose: 1 1/2 inch diameter with 1 1/2 inch NPT connections at each end. Provide 30 foot long section of hose with each hose reel assembly. Goodyear Arctic Ortac or approved equal.
- C. Fleet Dispensing Breakaway Connection: UL listed 1 1/2-inch breakaway fitting. OPW model no. 66SP-5150 with hose section OPW model no. 66H-1300 or approved equal.
- D. Fleet Dispensing Hose Swivel: UL listed hose swivel. PT Coupling model FOB150MF, or approved equal.
- E. Fleet Dispensing Hose Nozzle: UL listed automatic shut off, heavy duty, high flow fill nozzle with hold open latch and color coded handle, yellow for diesel #1 , green #2 and red for gasoline. OPW 1290-0050, or approved equal.

- F. Fleet Dispensing Hose Reel: Spring rewind hose reel capable of holding 40 feet of 1 ½ inch I.D. hose. Reel shall be top rewind. Hannay 922-25-26A (Top Rewind) with utility hose rollers and ball stop for 1 ½ arctic hose, or approved equal.
- G. Fleet Dispensing 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.
- H. 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.

2.04 ACCESSORIES

- A. Fire Extinguishers: Portable with a rating of 3A-40BC. The location, installation, and containment of all extinguishers shall be in accordance with these Contract Drawings and with the IFC.

PART 3 – EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

3.03 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 16 Specifications.

3.04 TESTING

- A. At completion of installation, demonstrate that pumps will deliver specified capacity.
- B. See additional testing and startup requirement in Contract Drawings.

END OF SECTION

SECTION 15193

FUEL TANK APPURTENANCES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes requirements for fuel tank appurtenances.

1.02 PERFORMANCE REQUIREMENTS

- A. Design Service Conditions: All fuel tank appurtenances shall be rated for the following service conditions:
 - 1. Fluid; Gasoline and Diesel fuel
 - 2. Operating temperature range: 0 degree F to 120 degree F.
- B. Any reference standards that do not comply with these service conditions shall be brought to the Engineer's attention immediately.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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.

PART 2 – MATERIALS

2.01 GENERAL

- A. Provide tank accessories as required and as shown on the Contract Drawings. Coordinate connections to the tank.

2.02 TANK ACCESSORIES & APPURTENANCES

- A. Manholes: 24-inch nominal size, 5/16-inch steel lid (single punch), 1/4" mild steel ring with 7-inch riser height, Clay & Bailey MR820-0600 or approved equal. Provide complete set of bolts and Buna-N gasket for lid.
- B. Pressure/Vacuum Whistle Vents: Aluminum body and hood, stainless steel screens and float, brass internals, Viton seals. 3" FTP connection for all tanks, 8 oz/square inch pressure setting, 1 oz/square inch vacuum setting. High intensity

whistle alarm on rise of float at adjustable level. Morrison Bros. Figure 922, or approved equal.

- C. Emergency Vents: UL listed, aluminum body, brass seat, cast iron cover, flanged connections, sized in accordance with UL 142. Set to open at 16 ounces per square inch pressure. 6" size – 278,000 CFH relief capacity at 2.5psig, 8" size – 500,000 CFH relief capacity at 2.5 psig. 10" size – 800,000 CFH relief capacity at 2.5 psig. Morrison Bros. Figure 244OF with flanged adapter, or approved equal. Loose manholes not permitted.
- E. Gauge Hatch: Brass cap, brass adapter, and brass chain, Buna-N gasket, 2-inch FPT connection. Morrison Figure 307, or approved equal.
- F. Float Switches: See "Electrical Equipment Schedule" in the Contract Drawings.
- G. Liquid Level Gauge: Clock-style gauge with readout in feet and inches up to 12 feet, accurate to 1/4-inch over full scale. Aluminum body, 2-inch MPT connection, stainless steel float sized to pass through 2-inch bung opening. Morrison Bros. Figure 818 or approved equal.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Coordinate tank connection sizes with all tank appurtenances

3.02 INSTALLATION

- A. Install tank appurtenances in accordance with the contract drawings, applicable codes, and per the manufacturer's installation instructions.
- B. Select emergency vent size in accordance with UL 142. Loose bolted flanged manholes are not permitted for use as emergency vents.
- C. Provide bushings where required.

3.03 TESTING

- A. Calibrate level gauges to the tank and verify correct readings.
- B. Check operation of fill alarms and overfill protection valves prior to completion of the work.

END OF SECTION

SECTION 16010
GENERAL ELECTRICAL PROVISIONS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide the labor, materials, equipment and test equipment necessary to furnish, install, and place into operation the power, motor, lighting, control, alarm, and associated electrical systems of this Contract. Connect motors, meters, panels, sensors, switches, and outlets or any other electrical device installed or provided as part of the project. Mark and identify circuits, terminal boards, equipment, enclosures, etc. with identification numbers, wire numbers, nameplates, and warning signs. Test, adjust and calibrate equipment and start-up all electrical equipment and its associated mechanical attachments as necessary to place the project into operation.
- B. Provide and install all control equipment and wiring to instruments and devices installed by others.
- C. Where the work of several crafts is involved, coordinate all related work to provide each system in complete and in proper operating order.
- D. Cooperate with all others involved in the project, with due regard to their work, to promote rapid completion.
- E. 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, climate conditions, and all other local conditions which may affect the progress and quality of work.

1.02 RELATED REQUIREMENTS

- A. This Section applies to all Division 16 work and part of all other Division 16 sections.
- B. See Divisions 1 and 2 of which contain information and requirements that apply to work specified herein.
- C. Contractor shall review the Contract Documents and Specifications for equipment furnished by other crafts but installed in accordance with this Section. Bring questionable or obscure items, apparent conflicts between plans, specifications, governing codes and/or utility regulations to the attention of the Project Engineer. Codes, ordinances, regulations, manufacturer's instructions or standards take precedence when they are more stringent or conflict with the Contract Documents and Specifications.
- D. It shall be the responsibility of the Contractor to provide electrical service to, connection and/or interconnection of various units of equipment supplied by others. The Contractor shall not be required to set in place or align motors or devices supplied as an integral part of equipment provided by others.

- E. See also the following Sections:
 - 1. Section 01300 – Submittals
 - 2. Section 15175 - Aboveground Fuel Storage Tanks
 - 3. Section 15191 - Fuel Piping System
 - 4. Section 15192 - Pump and Equipment
 - 5. Section 15193 - Fuel Tank Appurtenances

1.03 WORKMANSHIP

- A. Installation of all Work shall be made so that its several component parts shall function as a workable system complete with all accessories necessary for its operation.
- B. All material and equipment shall be installed in accordance with the manufacturer's recommendations, instructions and/or installation drawings and in accordance with NECA standards.
- C. Materials and equipment shall be new and shall conform to applicable industry standards, NEMA standards and Underwriter's Laboratories (UL) standards.

1.04 ELECTRICAL SUPPLY

- A. Electrical power for this project Shall be a 15kW diesel fired generator in a weatherproof housing. See plans for specification.

1.05 CODES AND STANDARDS

- A. Codes: Perform all work in strict accordance with all applicable national, state, and local codes; including, but not limited to the latest legally enacted or adopted editions of the following specifically noted requirements; including all State and local amendments to these codes:
 - 1. NFPA 79, National Electric Code - NEC
 - 2. ANSI-22, National Electrical Safety Code - NESC
 - 3. International Building Code – IBC
 - 4. International Fire Code – IFC
 - 5. Uniform Building Code - UBC
 - 6. Uniform Fire Code - UFC.
- B. Standards: Reference to the following standards infers that installation, equipment, and materials 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 Consultants - ASHRAE (Standard 90-75)
4. Factory Mutual - FM
5. Institute of Electrical and Electronics Consultants - IEEE
6. National Electrical Contractors Association - NECA
7. National Electrical Manufacturers' Association - NEMA
8. National Fire Protection Association - NFPA
9. UL 508A, Underwriters Laboratory - UL

1.06 PERMITS

- A. Secure and pay for all fees, permits, etc. required by local and State agencies and all local utility companies.

1.07 SPECIFIC TERMINOLOGY

- A. 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.
- B. "Accessible" means arranged so that an appropriately dressed man 6-foot 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 perform the task to be accomplished, without disassembly or damage to the surrounding installation.
- C. The word "Contractor" as used in Division 16 specifications shall mean "Electrical Contractor."
- D. The word "General Contractor" as used in Division 16 specifications shall mean the Contractor responsible for the project.
- E. "Engineer or Project Manager" is the Authority's Representative as defined in the General Conditions of the Contract.
- F. "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.
- G. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
- H. "Product" is a generic term which includes materials, equipment, fixtures, and any physical item used on the project.

- I. "Provide" means furnish all products, labor, sub-contracts, and appurtenances required and install to a complete and properly operating, finished condition.
- J. "Rough-in and Connect" means provide an appropriate system connection such as conduit with "J" boxes, wiring, switches, disconnects, etc., and all wiring connections. Equipment furnished is received, uncrated, assembled and set in place under the Division in which it is specified.
- K. "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.

1.08 DRAWINGS, SPECIFICATIONS & SYMBOLS

- A. The Contract Drawings and Specifications are complementary; what is shown on one is as binding as if called for in both. Do not scale the Contract Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
- B. The Contract 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 and should be universally understood. Special items are identified by a supplementary list of graphical illustrations, or called for on the Contract Drawings or in the specifications.
- D. The electrical "legend" on the Contract Drawings is a standardized version and all symbols shown may not be used. Use the "legend" as a reference for the symbols used on the Contract Drawings.

1.09 SUBMITTALS, MANUALS AND SHOP DRAWINGS

- A. Submit to the Engineer for review and approval, as soon as practical after the date of notice to proceed and before commencement of installation or fabrication of any materials or equipment, product manuals containing catalog numbers, wiring diagrams, rough-in dimensions, performance data, detailed drawings, and instructions for installing, operating and maintaining the material and equipment proposed for installation in the electrical work.
- B. The manuals shall be supplied to the Engineer for review and approval in the quantities indicated in Division 1 specifications before any electrical equipment is shipped to the job site. Record ("As Built") drawings of the work shall be provided upon completion of the work and shall be folded and punched for insertion into the manual after they are reviewed and approved by the Engineer.
- C. Submittals and manuals for the electrical system shall consist of hard cover, three-post, expandable metal hinge binders labeled with the job name and the Contractor's name with an index and tab dividers clearly identifying each major

type of material and equipment by item, name or designation used on the Contract Drawings.

- D. Any drawings required to be prepared by the Contractor or his agent shall be of standard size no larger than 22-inch by 34-inch and with symbols similar to those used herein, with either the vendor's or Agency border. If legible, submittals on half size (11x17) bond paper are acceptable. Submittal shall also include a single copy of a ".pdf" file and a ".dwg" file with a ".ctb" file for printing. Drawings shall be prepared using AutoCAD V.2010 or later.
- E. Submit all electronic media including cut sheets, O&M information and instructions in either MS Word (.doc) or Adobe (.pdf) format on a CD formatted for reading on Intel-based PCs (not MAC).
- F. Provide manufacturer's installation, operation, maintenance, and service information, shop drawings, etc., for each panel, switchboard, motor control center, and equipment items furnished under the electrical work. Assemble and index each section listing the contents individually on the tab divider for that section. Compile a spare parts list and a supplier's index for each section and assemble in the section provided. Assemble records of all tests, measurements, and calibration settings made for each device. See Section 01300, Submittals.
- G. Submittals: Provide submittals for all products and systems described in Division 16 specifications and shown on the Contract Drawings to demonstrate compliance with the requirements of the project. Submit data not later than 60 days after Award of Contract. Furnish equipment submittals in the manner described elsewhere in these specifications. In addition, include data for review, and organize data, as noted below:
 - 1. Specific reference and/or drawings 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 phone number.
 - 3. Catalog designation or model number with rough-in data and dimensions.
 - 4. Operation characteristics.
 - 5. Complete customized listing of characteristics required. Indicate whether item is "As Specified" or "Proposed Substitution." Indicate any deviations on submittal. Mark out all non- applicable items. The terminology "As Specified" used without this customized listing is not acceptable.
 - 6. Wiring diagrams for the specific system.
 - 7. Coordination data to check protective devices.
 - 8. Working construction Drawings (Shop Drawings).
- H. Submittal Data:

1. Prior to the submission of the required shop drawings, hold a meeting with all the trades and check the shop drawings for discrepancies, dimensional errors, omissions, contradictions, and departures from the Contract requirements. The shop drawings shall then be corrected and submitted to the Engineer with appropriate notes.
2. With prior permission from the Engineer, partial submittals will be considered for review provided that they are complete sections, as listed below:
 - a. Individual Special Systems (Control Panels, etc.)
 - b. Lighting Fixtures, Lamps and Accessories
 - c. Service, Disconnects
 - d. Raceways, Fittings, and Supports
 - e. Wire and Cable
 - f. Wiring Devices
3. Mark submittal literature and shop drawings clearly and bind 8-1/2-inch by 11-inch literature in three-hole loose-leaf binders by individual sets.
4. 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 or operation of manufactured equipment.
5. Where allowed, substitutions will be reviewed using the criteria /manufacturer's data of the specified component.
6. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provision of a complete and satisfactory working installation of equal quality to system specified is the sole responsibility of the Contractor.

1.10 TESTS

- A. **FACTORY TESTS:** All control panels will be tested prior to shipping. Panel operation will be demonstrated using simulated inputs and alarm conditions. Tests will be observed by ENGINEER and will not be shipped until panel(s) meet the functional and technical requirements established in the specifications and drawings. Successful operation as determined by the ENGINEER will be acknowledged in writing.
- B. **FIELD TESTING:** The CONTRACTOR shall prepare and submit a test plan for review and approval by the ENGINEER.
 1. Field testing cannot take place without an approved test plan.
 - a. The Test Plan shall outline the tests planned for each item of equipment.

- b. The Test Procedures shall identify the test equipment to be utilized, the action of each test step and the expected result so that a test technician who has no knowledge of the details of the equipment design shall be able to successfully conduct the test.
2. In the presence of the ENGINEER,
 - a. Test the equipment and electrical circuits for proper connection, continuity, and absence of undesirable shorts and grounds.
 - b. Test wire and cable installation, when complete and again 72 hours prior to energization of the system.
 - c. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.
 - i. Megger bus work, switches, breakers and circuits phase-to-phase and phase-to-ground disconnecting and reconnecting equipment which cannot be meggered otherwise.
 - ii. The minimum acceptable steady-state value is 50 megohms. Ambient temperature and humidity during testing shall be recorded.
3. Verify operation, calibration, and settings of the meters, relays and indicating devices.
4. Check all auxiliary equipment, i.e., heaters, thermostats, lights, and all illuminated indicating devices and lamps, and all audible alarm devices to verify that they function properly.
5. Take distribution equipment test load readings after all loads are connected. Obtain the maximum reading for each phase and neutral with all lighting, appliances, motors (as applicable use largest combination), and other loads connected to the panels in service.
6. Test the resistance of the grounding electrodes in the presence of the ENGINEER.
 - a. The measurement shall be done with a ground ohmmeter or the IEEE Standard No. 550, Paragraph 3.42 method.
 - b. Testing shall be performed during normal dry weather conditions with at least 5 non-rain days elapsing prior to the test.
 - c. Measured resistance of the electrode to ground exceeding 3 ohms shall require supplemental electrode additions until electrode resistance to ground is less than 3 ohms.
 - d. Maximum equipment ground impedance is 25 ohms.
7. Check fuses with an ohmmeter; ring out wiring and busing; check operation of control and safety interlocks.

8. Test motor driven equipment motors before energization. Insulation test shall consist of megohmmeter check phase-to-ground, per IEEE Standard 43 or manufacturer's recommendations.
 9. Load test each motor of motor driven equipment showing the following:
 - a. Nameplate ratings (horsepower), (speed), (voltage), (phase), (ampere rating of motor at full load).
 - b. Measured load in amperes on lines 1-2.
 10. Load test pump motors, noting the operating conditions at the time of the test. Motor test data shall show suction and discharge conditions (pressure, temperature, humidity, to where such conditions affect load).
 11. Overload heaters shall be checked and the size on each phase shall be noted at this time on the test sheet.
- C. Report all test results in writing. Where tests disclose problem areas, retest after the defect has been corrected.
- D. Demonstrate to the AUTHORITY that the electrical installation is working by operating all electrical systems and equipment. Simulate control inputs, responses to outputs and alarm conditions and their acknowledgement, artificially where necessary, for complete system tests.
- E. Operate the electrical systems until acceptance of the work. Instruct The AUTHORITY's employees in the correct operation of all electrical and control systems under your jurisdiction.
- F. Any rework or repair of equipment required during or as a result of the testing shall be done by the Contractor at no additional expense to the AUTHORITY.
- G. The Contractor shall furnish to the AUTHORITY at the time the project is accepted, any special tools, calibration equipment, and testing apparatus specified or furnished by the equipment manufacturer for the proper adjustment and maintenance of the electrical equipment provided.

1.11 CODES AND INSPECTIONS

- A. Electrical work shall be installed in accordance with the latest edition of the National Electric Code and local and state codes in legal force in the project area.
1. If the Contractor observes that the Contract Drawings and/or Specifications are at variance with such codes and regulations, he shall promptly notify the ENGINEER in writing.
 2. Should the Contractor perform any work in non-compliance with the above-mentioned codes and regulations without such notice to the ENGINEER, the Contractor shall bear all costs arising therefrom.

- B. The above codes are referenced to establish minimum requirements and wherever this specification requires higher grades of material or workmanship than required by the codes, this specification shall prevail.
- C. All electrical work shall be performed by Alaska licensed Journeyman Electricians or licensed Apprentice Electricians under the direct supervision of a licensed Electrical Administrator.
- D. Submit written proof of all Journeyman and Apprentice Electricians' current licenses.
- E. Submit certification for tests and inspections required by the electrical inspector having jurisdiction. Certificates of approval that are issued shall be transmitted to the AUTHORITY with a copy to the ENGINEER.
- F. The Contractor shall pay all costs and fees required by inspecting and other agencies required for his work.
- G. Cooperate with the ENGINEER and provide assistance at all times for the inspection of the electrical work performed under this Contract. Remove covers, operate machinery, or perform any reasonable work which, in the opinion of the ENGINEER, will be necessary to determine the completeness, quality, or adequacy of the work.

1.12 COORDINATION

- A. Electrical Contract Drawings are partly diagrammatic and it is not the intent to show in detail all features of work or exact physical arrangement of equipment. The location of outlets and equipment are approximate unless dimensioned. The exact locations and routing of conduits shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance.
- B. If conduit is placed incorrectly with respect to equipment connections or if equipment connections are relocated without appropriate changes in the electrical work, and the resulting work is not coordinated, the work affected shall be removed and re-installed at the Contractor's expense, even if removal and replacement of structural and/or mechanical parts of the work are necessary.
- C. The Contractor shall schedule his work to coordinate through the General Contractor and with all other subcontractors, power and telephone utilities in order to maintain job progress and to avoid conflicts with equipment installation or work done by the various trades.
- D. The Contractor is responsible for maintaining required clearspace. Should the Contractor become aware of a clearspace violation or if the installation of electrical equipment as shown produces a clearspace violation, notify the ENGINEER in writing before proceeding with the installation.

1.13 LOCATIONS

- A. All work performed in classified areas shall be done in strict compliance with Articles 500, 501, 514 and 515 of the NEC.
- B. Hazardous Locations: The following classifications have been assigned per NEC.
 - 1. Class 1, Division 1
 - a. Extends 5' in all directions around all Gasoline tank vents.
 - b. Area inside the Dual Dispenser and inside and below the pan basin.
 - 2. Class 1, Division 2
 - a. Extends 10' in all directions around all Gasoline tanks.
 - b. Space inside dike level to the top of dike.
 - c. The area 18" above grade and within 20' of the Gasoline Header.
 - d. The area 18" above grade and within 20' of the Dual Dispenser.
 - e. The area within 10' if the gasoline side of the Dual Product Dispenser Tank (T3A).
- C. Hazardous boundaries have been placed on the drawings. All electrical penetration of hazardous boundaries shall be provided with seal-off fittings. Locations for seal-off fittings on all conduit penetrating classified locations shall be as required by code and shall be field determined by the Contractor.
- D. Wet Locations: Wet locations shall include all areas underground (below grade), in direct contact with the earth, areas subject to saturation with water or other liquids from splashing, surface water, exposed to the weather and unprotected.

1.14 RECORD DRAWINGS

- A. Reference requirements stated elsewhere in these specifications.
- B. In addition to other requirements, mark up a clean set of Contract Drawings as the work progresses, to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing or work in permanently concealed blind spaces within the facility. Show complete routing and sizing of any significant revisions to the systems shown.
- C. Maintain Record drawings in an up-to-date fashion in conjunction with the actual progress of installation. "Record" progress mark-ups shall be available on-site for examination by the Engineer at all times.
- D. Provide "As-built" Shop Drawings of each type of control panel.
- E. Prepare wiring diagrams on reproducible media using AutoCAD V2009 or later for all individual special systems as installed. Identify all components and show all wire and terminal numbers and connections.

- F. Prior to substantial completion, deliver these full size (22"x34") hard copy drawings and their electronic files, on CD, in both .dwg and full size .pdf format to the Engineer and obtain a written receipt.

1.15 OPERATING INSTRUCTIONS

- A. Prior to final acceptance, CONTRACTOR shall instruct the OWNER and AUTHORITY on the proper operation and maintenance of all electrical systems and equipment under this contract. 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 ENGINEER.

1.16 OPERATION AND MAINTENANCE MANUALS

- A. Provide two (2) copies of Operation and Maintenance Manuals in the manner described elsewhere in these specifications for the training of the Authority's personnel. In addition, organize manual and include data and narrative as noted below. Bind each manual in a hard-backed loose-leaf binder. Provide a non-password protected .pdf file of each manual in its entirety on a CD in addition to the required hard copies.
- B. Provide a separate chapter for each section of the electrical specifications with subchapters 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. Label all pages to assure correct placement in manual. Identify each piece of equipment with its associated nameplate number, i.e. pump P-1, etc.
- 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 which should be accomplished for each system.
 - 4. Provide the above descriptions in typewritten, simple outline, narrative form.
- D. Maintenance Instructions:
 - 1. Provide complete instructions and a schedule of preventive maintenance, in tabular form, for each product.
 - 2. Schedule shall include recommended frequency of performance for all routine cleaning, inspection and lubrication with recommended lubricants.
 - 3. Provide instructions for minor repair or adjustments required for preventive maintenance routines.

4. Provide all information of a maintenance nature covering warranty items, etc., which have not been discussed in the manufacturer's literature or the operating sequence narrative.
 5. Provide complete informational data for all the spare and replacement parts for each product and system. Properly identify each component by part number and manufacturer.
- E. Manufacturers' Brochures: Include manufacturers' descriptive literature covering all 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. Brochure bearing submittal review stamp are not acceptable.
- F. Shop Drawings: Provide a copy of all corrected, approved shop drawings for the project either with the manufacturers' brochures or properly identified in a separate subsection.

1.17 INSTRUCTION OF OPERATING PERSONNEL

- A. Provide services of qualified representative of supplier of each item or system listed below to instruct AUTHORITY and OWNER in operation and maintenance of item or system.
- B. Make instruction when system is complete of number of hours indicated, and performed at time mutually agreeable.
1. Electrical Distribution Equipment: 4 hours
 2. Alarm and Control Panels: 4 hours per panel
- C. Have approved operating and maintenance data, and parts lists for all equipment on hand at the time of instruction.

1.18 WARRANTY

- A. The Contractor shall guarantee all work executed under this contract to be free from defects in materials and workmanship for a period of one (1) year from beneficial occupancy.
- B. Any faulty materials or workmanship shall be repaired or replaced by the Contractor to the satisfaction of the Owner or Authority at no additional cost during the warranty period.

1.19 PROJECT COMPLETION AND DEMONSTRATION

- A. Tests: During final inspection, conduct operating tests for approval.
- B. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents. Should a 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.

- C. Have instruments available for measuring, voltage and current values and for demonstration of continuity, ground, or open circuit conditions. Furnish personnel to assist in taking measurements and making tests.
- D. 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 AUTHORITY.

1.20 CERTIFICATE OF COMPLETION

- A. Submit, at time of request for Final Inspection, a completed letter in the following format:

I, _____(Name), of _____(Firm), certify that the Electrical Work is complete in accordance with Contract Drawings 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 Specification requirements have been fulfilled:

- 1. Megger readings performed, ____ copies of log attached.
- 2. Operating manuals completed and instructions of operating personnel performed _____(Date). _____(Signed)
Engineer
- 3. Record drawings up-to-date and ready to deliver to Engineer.
- 4. Emergency systems tested and fully operational.
- 5. All other tests required by Specifications have been performed.
- 6. All systems are fully operational. Project is ready for Final Inspection.

_____(Signed) _____(Title) _____(Date)

PART 2 – MATERIALS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 16100
BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes specific requirements, products, and methods of execution which are typical throughout the Electrical Work of this Project. Additional requirements for the specific systems will be found in the Division specifying those systems.

1.02 RELATED REQUIREMENTS

- A. Section 16010 – General Electrical Provisions
- B. All other Division 1, 2, 15 and 16 Specifications

1.03 COORDINATION

- A. Layout all the work in advance and avoid conflict with other Work in progress. Physical dimensions shall be determined from Civil and Structural plans. Verify locations for junction boxes, disconnect switches, stub-ups, etc., for connection to equipment furnished by others, or in other Divisions of this Work.

1.04 SERVICEABILITY OF PRODUCTS

- A. Furnish all products to provide the proper orientation of serviceable components to access space provided.
- B. Coordinate installation of all products to allow proper service areas for any items requiring periodic maintenance inspection or replacement.
- C. Replace or relocate all products incorrectly ordered or installed.

1.05 ACCESSIBILITY OF PRODUCTS

- A. Arrange all work to provide access to all serviceable and/or operable products. Layout work to optimize net usable access space within confines of space available. Advise ENGINEER, in a timely manner, of areas where proper access or required clearspace cannot be maintained. Furnish Layout Drawings to verify this claim, if requested.
- B. Provide access doors in ceilings, walls, floors, etc., for access to J-boxes, automatic devices, and all serviceable or operable equipment in concealed spaces.

PART 2 – MATERIALS

2.01 MATERIALS FURNISHED IN DIVISION 16

- A. All products furnished and installed in permanent construction shall be new, full-weight, standard in every way, and in first class condition.
- B. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent

testing laboratory acceptable to the local Code- enforcement agency having jurisdiction.

- C. Products shall be identical with apparatus or equipment which has been in successful operation for at least two years. All products of similar class or service shall be of one manufacturer.
- D. Capacities, sizes, and dimensions given are minimum unless otherwise indicated. All systems and products proposed for use on this project shall be subject to review for adequacy and compliance with Contract Documents.

2.02 MATERIALS FURNISHED IN OTHER DIVISIONS

- A. Controls, including conduit, wiring, and control devices required for the operation of systems furnished in other Divisions shall be installed in accordance with Division 16 Specifications.
- B. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent testing laboratory acceptable to the local Code-enforcement agency having jurisdiction.
- C. All work on the project that falls under the jurisdiction of the electrical trade shall be performed by Licensed Electricians in possession of Alaska State Fitness Cards in conformance with the Electrical Specifications.
- D. Provide complete wiring and power connections to equipment requiring electrical power but specified under other Divisions of the Specifications. Equipment shall include but is not limited to motors, pumps, dispensing equipment, feeders, connections, disconnects, motors running overcurrent protection, etc.
- E. Contractor to review equipment submittals from other trades prior to installation and electrical rough-in. Verify location, size, connections and that equipment is ready for electrical connection.
- F. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with the manufacturer's instructions.
- G. Provide interconnecting wiring and disconnects where required.
- H. Where starters are provided as part of a packaged product, overcurrent heaters shall be provided.

2.03 ENCLOSURE RATINGS

- A. Unless noted otherwise, enclosures, junction boxes and other equipment shall be installed in accordance with the following schedule:
 - 1. Exterior, Non-hazardous – NEMA 4X Non-metallic
 - 2. Exterior, Hazardous – NEMA 7 (Class 1, Group D) and NEMA 4 or 4X

2.04 IDENTIFICATION

- A. Equipment Labels and Nameplates:

1. Provide rigid engraved labels and nameplates of three-layered laminated plastic 1/16-inch thick with white letters on a black or gray background unless otherwise noted.
 - a. Label for electrical distribution, control equipment and loads served shall be black letters on white background.
 - b. Label for emergency equipment shall be white letters on a red background.
2. Securely attach labels or nameplates to equipment fronts with minimum two screws or rivets, per label, unless rating of panel is affected, use epoxy or applicable adhesives.
3. Temporary markings are not permitted on equipment. Repaint trims housings, etc., where markings cannot be readily removed. Refinish defaced surfaces.
4. No labeling abbreviations will be permitted without prior approval.
5. Label and Nameplate Locations:
 - a. Provide 1/2-inch minimum height letters on following equipment:
 - 1) Service disconnects (red background).
 - 2) Secondary feeder breakers in distribution equipment. Designation as required by load served.
 - 3) Special equipment housed in cabinets, as designated on plans, on outside of door.
 - b. Provide 1/4-inch minimum height letters on:
 - 1) Disconnects and starters for motors or fixed appliances - (include item designation and branch feeder circuit number); and
 - 2) Designated electrical equipment.
 - 3) Panel boards.
 - c. Provide 1/8-inch minimum height letters on:
 - 1) Individual switches.
 - 2) Motor starters.
 - 3) Loads served.
- B. Branch Circuit Panelboard Schedules: 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, interior; receptacles, work bench; etc.) as approved.
- C. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits provided for future equipment.
- D. Conduits: Mark all conduits entering or leaving panels with indelible black marker with the circuit numbers of the circuits contained inside.
- E. Junction Boxes: Mark with indelible black marker the circuit numbers of wiring on all junction boxes with sheet steel covers.

F. Conductors:

1. Branch circuit conductors shall be color coded as indicated in Section 16120, Wire and Cable.
2. Control and alarm circuit conductors
 - a. Field conductors shall be identified by destination panel and terminal block designations.
 - b. Internal (Control Panel) numbering system shall provided by the Contractor. The numbering system shall assign each logical conductor set a unique identification number that will be reflected on the as-built drawings.

PART 3 – EXECUTION

3.01 STORAGE AND HANDLING

- A. All items shall be delivered and stored in original containers, which shall indicate manufacturer's name, the brand, and the identifying number.
- B. Items subject to moisture and/or thermal damage shall be stored in a dry, heated place.
- C. All items shall be covered and protected against dirt, water, chemical and/or mechanical damage.

3.02 PROTECTION OF PRODUCTS

- A. The Contractor shall be held responsible for products to be installed under this Contract.
- B. The Contractor will be required to make good, at his own cost, any injury or damage which said products may sustain before Final Acceptance.

3.03 INSTALLATION

- A. All products shall be installed by skilled craftsmen. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the NECA "Standards of Installation," which herewith is made part of these Specifications.
- B. **WORKING SPACE AND REQUIRED CLEARANCES ABOUT ELECTRIC EQUIPMENT (600 VOLTS, NOMINAL, OR LESS):** Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment.
 1. **WORKING CLEARANCES:** Except as elsewhere required or permitted in the NEC, the dimension of the working space in the direction of access to live parts operating at 600 volts, nominal, or less and likely to require examination, adjustment, servicing, or maintenance while energized shall not be less than indicated in NEC. Distances shall be measured from the live parts if such are enclosed. Concrete, brick, or tile walls shall be considered as grounded.
 2. In addition to the dimensions shown in the table, the work space shall not be less than 30 inches wide in front of the electric equipment.

3. CLEAR SPACES: Working space required by this section shall not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.
 4. Where clear space has been penetrated by ground level piping. Platforms providing the required footprint (30X36 minimum) shall be provided at no additional cost to the OWNER.
- C. Repair all surfaces and furnish all required products and labor to maintain fire-proof, air-tight and water- proof characteristics of the construction.
- D. Installation of all equipment shall be in accordance with manufacturer's instructions.

3.04 MOUNTING SYSTEMS

- A. Provide all bracing as required to securely mount enclosures, fixtures and devices.
- B. Unless otherwise noted, all materials used shall be hot dipped galvanized hardware and galvanized formed steel components such as Unistrut or equal. Where support elements are field cut, exposed metal shall be coated with spray-on galvanizing.
- C. Support from structure only.
- D. When bolting to structure, verify that the original structure and performance (i.e. water tight) characteristics are maintained.
- E. Conduits shown to be run at grade shall be supported every 10 feet by wood sleepers as shown on the drawings. Conduits may share fuel piping sleepers if installed such that neither system will require removal during maintenance or replacement.

3.05 MOUNTING HEIGHTS

- A. Mounting heights shall be above finished floor (AFF) or above finished grade as noted below, unless otherwise shown or indicated.
- Lighting Switches, 46 inches to center
- Receptacles shall be mounted as high as practicable on dike walls, but not less than 36" above grade.
- B. Other mounting heights are indicated on the Drawings by detail. Specific dimensions AFF are shown adjacent to the symbol.

3.06 CUTTING AND PATCHING

- A. Obtain written permission from the ENGINEER before cutting or piercing structural members.
- B. Sleeves through floors and walls to be galvanized iron pipe, flush with walls, ceilings or finished floors, sized to accommodate the raceway. Interstitial space around conduit passing through sleeves shall be filled with non-hardening duct sealant.

3.07 PROTECTIVE FINISHES

- A. Take care not to scratch or deface factory finish on electrical apparatus and devices. Repaint all marred or scratched surfaces.
- B. Provide hot dip galvanized components for ferrous materials exposed to the weather.

3.09 CLEAN-UP AND COMMISSIONING

- A. Throughout the Work, the Contractor shall keep the work area reasonably neat and orderly by periodic clean-ups.
- B. As independent parts of the installation are completed, they may be commissioned and utilized during construction.

3.10 WARRANTY

- A. Unless otherwise specified, the Warranty starts on the date Written Notice is given that the project is complete and all required corrections have been made. Warranty shall certify that all defects in products or workmanship shall be promptly repaired or replaced by the Contractor, to the satisfaction of the AUTHORITY, for a period of one year, except when, in the opinion of the ENGINEER such failure is due to neglect or carelessness by the AUTHORITY.

3.11 OPERATIONAL INSTRUCTIONS

- A. The Contractor shall instruct the AUTHORITY in the operation of the products shown and/or specified. Allow one day on-site in base bid for Division 16.

END OF SECTION

SECTION 16110
CONDUITS AND FITTINGS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This section describes specific requirements, products, and methods of execution relating to conduit and conduit fittings approved for use on this project. Type, size and installation methods shall be as shown on the Contract Drawings, required by Code and specified in these specifications.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods
- C. Section 16450 - Grounding

1.03 QUALITY ASSURANCE

- A. Conduit and conduit fittings shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and be in conformity with applicable standards and UL listings.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data: Submit shop drawings and product data for the products of this section in compliance with Section 16010, General Electrical Provisions.

PART 2 – MATERIALS

2.01 GALVANIZED RIGID CONDUIT (GRC)

- A. Galvanized rigid conduit shall be mild steel with continuous welded seam, hot-dip galvanized complying with ANSI C80.1 and shall be UL listed.
- B. Elbows, bends, and fittings shall be made of full weight materials complying with the above and shall be coated and threaded the same as conduit.
- C. Threads for conduit shall be tapered and clean cut. All threads shall be hot dip galvanized after cutting.
- D. Conduit shall be 1/2-inch trade size or larger and shall be manufactured by Allied Tube and Conduit Corp., Triangle PWC, Inc., or approved equal.

2.02 INTERMEDIATE METAL CONDUIT (IMC)

- A. Intermediate metal conduit shall be mild steel, hot-dip galvanized complying with Fed. Spec. WWC-581 and shall be UL listed.
- B. Elbows, bends, and fittings shall be made of full weight materials complying with the above and shall be coated and threaded the same as conduit.

- C. Threads for conduit shall be tapered and clean cut. All threads shall be galvanized after cutting.
- D. Conduit shall be 1/2-inch trade size or larger and shall be manufactured by Allied Tube and Conduit Corp., Triangle PWC, Inc., or approved equal.

2.03 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Liquidtight flexible conduit shall be manufactured from galvanized steel strip, sealed with a polyvinyl outer jacket and shall be UL listed.
- B. Fittings shall be designed for use with liquidtight flexible conduit and shall maintain electrical continuity throughout fittings and conduit.
- C. Liquidtight flexible metal conduit shall be 1/2-inch trade size or larger and shall be manufactured by O-Z/Gedney Co., Southwire Co., or approved equal.

2.04 FLEXIBLE EXPLOSIONPROOF CONDUIT (COUPLINGS)

- A. Flexible explosionproof conduit shall be manufactured from braided steel or copper alloy with inner insulating liner.
- B. Fittings shall be threaded.
- C. Flexible explosionproof conduit shall be 1/2-inch trade size or larger and shall be manufactured by Crouse-Hinds "Series EC," Killark "Series EKJ," or equal.

2.05 FITTINGS

- A. Expansion fittings shall be O.Z. type AX, EX, EXDS, TX, or EXE; Crouse Hinds type XJ; or approved equal.
- B. Fittings utilized with rigid steel shall be galvanized steel.
- C. Conduit bushings shall be of the insulated type. Where grounding bushings are required, insulated grounding bushings with pressure type lugs shall be provided.
- D. Lock rings shall be of the sealing gland type.
- E. Provide conduit bushings on all penetrations without hubs.
- F. Fittings for liquid-tight flexible conduit shall be steel or malleable iron, of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. All throats shall be insulated.
- G. Seal-Off fittings shall be listed for the Class and Division required (or greater). Provide fittings that do not require de-rating conduit fill capacities or adjust conduit size to accommodate fitting limitations. Complete sealing after final acceptance is complete and all wiring has been verified.
- H. Fittings used in Hazardous locations shall be approved for use if approval is required.

2.06 GROUNDING REQUIREMENTS

- A. All fittings, connectors, boxes, etc. shall be approved for use as a grounding means.

PART 3 – EXECUTION

3.01 CONDUIT USAGE

- A. Galvanized rigid conduit shall be used for all wiring in classified areas and general wiring, except as otherwise specified herein or indicated on the Contract Drawings.
- B. Suitably protected (bituminous wrap or other coating) rigid conduit shall be used for underground, in slab or direct burial installations.
- C. Intermediate metal conduit may be used for general wiring and in place of rigid conduit, except as otherwise specified herein or indicated on the Contract Drawings.
- D. Electrical metallic tubing may be used for conduits 1- inch trade size and smaller in dry, non-hazardous and non-corrosive areas.
- E. Flexible low temperature, liquidtight flexible metallic conduit shall be used in lengths 18 to 24 inches for connections to motors or equipment subject to vibration and where conduits transition between structures or on risers from below grade and into non-hazardous and Class 1, Division 2 areas. Longer lengths (36 inches maximum) may be used for equipment connection if grounding conductor is installed through conduit. Flex conduit may be used in Class 1, Division 2 locations with approved fittings.
- F. Flexible explosion proof couplings shall be used in Class 1, Division 1, Group D, hazardous areas as shown where flexible conduit connection is required. Maximum length is 36 inches.

3.02 CONDUIT INSTALLATION, GENERAL

- A. Install conduit exposed.
- B. Conduit field joints shall be cut square and reamed smooth. Threads shall be cleanly cut and joints drawn up tight. After make-up all exposed, non-galvanized surfaces of completed joint shall receive two coats of Zinc rich paint equal to "Zinc it", manufactured by CRC. No running threads will be permitted.
- C. Offsets and bends shall be made carefully, without reducing cross sectional area, and shall not be less than the radius of standard elbows.
- D. Convenience outlets, switches, and other devices located on walls shall be serviced from above, unless otherwise indicated.
- E. Install expansion fittings where conduits cross structural expansion joints.
- F. Raceways penetrating vapor barriers or traversing from warm to cold areas shall be sealed (at the penetration point) with a non-hardening duct sealing compound to prevent the accumulation of moisture.
- G. All metal conduits shall have insulating bushings and shall have locknuts inside and outside of enclosure box, etc. Conduits smaller than 1-1/4-inch trade size shall be equipped with bushings and shall have locknuts inside and outside of enclosure.

- H. All conduit runs shall be grounded in an effective and approved manner at point of origin and shall maintain a continuous ground throughout all runs, cabinets, pull boxes, and fittings from point of service to all outlets.
- I. All conduit stubbed up out of floor and termination inside of an enclosure shall have insulating grounding bushings installed.
- J. Conduit Supports:
 - 1. Support conduits by wall brackets, pipe straps and unistrut sections, or trapeze hangers spaced not more than 10 feet on center.
 - 2. Conduits shall be supported from the structural system. Provide additional support as required for junction and pull boxes.
 - 3. Conduit risers along poles 1" and smaller may be secured using 2-hole galvanized straps. Conduits larger than 1" shall be supported using offset brackets and appropriate pipe straps.
 - 4. Where structural supports are not available provide wood block supports as shown on the Contract Drawings.
- K. All conduit runs shall be completed and cleaned free from foreign matter inside before conductors are drawn in. After installation conduit ends shall be plugged or capped to prevent the entrance of foreign materials.
- L. All conduits not used by this Contract shall have a pull wire installed and securely tied off at each end for future conductor installation.
- M. Paint all exposed raceways to match the surface to which it is attached or crosses. Otherwise paint industrial gray.
- N. Completely and thoroughly swab raceway system before installing conductors.
- O. All underground conduit shall be buried a minimum of 18-inches below finished grade.

3.03 CONDUIT INSTALLATION IN HAZARDOUS AREAS

- A. Conduit installation shall comply in all respects with the requirements of NEC for respective Class, Division, and Group installation. Conduit shall be threaded rigid type.
- B. All boxes, fittings, and joints shall be threaded for connection to the conduit.
- C. Threaded joints shall be made up of at least five threads fully engaged as described by NEC.
- D. Seals shall be provided as required by NEC, whether shown or not, in each conduit entering an arcing device, within 18 inches of device, in conduits entering an enclosure, and in conduit runs leaving a hazardous area. Seals shall be filled with the proper compound approved for the purpose and as recommended by the manufacturer.
- E. Run conduit exposed and securely anchored to walls with strap type supports. Pinch type supports shall not be used.

- F. Run conduits vertically wherever possible to avoid use of horizontal seals. When conduit is to be run horizontally, provide junction boxes in horizontal run and sealed risers to devices, rather than connecting directly between the devices.
- G. Conduits run beneath hazardous areas shall be considered within the hazardous area.

END OF SECTION

SECTION 16120
WIRE AND CABLE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes specific requirements, products, and methods of execution relating to wire and cable, 600 volts or less, approved for use on this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 – General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. All conductors shall be sized according to American Wire Gauge (AWG). Standing, insulation, rating, and geometrical dimensions shall conform to Underwriters Laboratory Specifications.

PART 2 – MATERIALS

2.01 GENERAL

- A. Conductors shall be copper, solid or stranded with Type XHHW-2 insulation.
- B. Wiring which is an internal part of a device and is not connected to external terminal blocks may be wired using manufacturer's standard wire designations.
- C. Wire which connects to external circuits, to terminal blocks, or the numbers shown on the elementary wiring diagrams shall identify other devices that are connected to external circuits.

2.02 FEEDER AND BRANCH CIRCUIT WIRING

- A. Insulation shall be 600 volt Type XHHW-2. Wiring in fixture channels shall be rated 90 degrees C. or over, 600 volt. Do not install thermoplastic insulated conductors when the temperature is below 0 degrees F.

2.03 FLEXIBLE CORD

- A. All flexible cord shall be type SOW-A, or for larger size cable, type G.

2.04 MISCELLANEOUS

- A. Miscellaneous wire and cable for special purpose applications and not covered in the categories as indicated above, shall be as shown on the Contract Drawings and/or required by the intended use.

2.05 MINIMUM SIZE

- A. Unless specified otherwise, minimum wire sizes shall be as follows:
 - 1. All 120 volt homeruns over 75 feet; No. 10 AWG

2. Branch circuit wiring; No. 12 AWG
3. Control circuit wiring; No. 14 AWG
4. Low voltage switching circuits if a part of an approved cable assembly; No. 20 AWG (No. 16 AWG otherwise)
5. Cable or conductors for other special systems shall be as described in other sections of the specifications, noted on the Contract Drawings, or recommended by the equipment manufacturer.

2.06 MISCELLANEOUS CONDUCTORS AND ACCESSORIES

- A. Control wiring 120V shall be Class C stranded copper conductor with Type MTW insulation. Minimum conductor size shall be No. 14 AWG or 16 AWG for PLC applications.
- B. Multi-conductor control cables shall be XHHW insulated, Class B stranded conductors in overall PVC jacket. Color coding shall be per IPCEA Method No. 1.
- C. Cords shall be stranded copper conductor Type SOW-A with green insulated grounding conductor.
- D. Connectors for splicing copper conductors shall be; "Scotchlok" insulated spring connectors for No. 18 through No. 6 AWG solid conductors; insulated, solid-barrel, crimp type plated copper alloy connectors for No. 18 through No. 6 AWG stranded conductors; plated copper alloy compression splicing sleeves installed by high-pressure compression tools for No. 4 and larger size stranded conductors.
- E. Insulating materials for splices shall be "Scotchfill" or equal for filling bolted or irregular areas before taping with Scotch No. 88, 33 plus or equal 7 mil vinyl plastic tape.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Conduit shall be completely installed, free from obstructions, and clean before installing conductors.
- B. Provide conductors from outlet to outlet and splice only at outlet or junction boxes.
- C. Install all conductors in a single raceway at one time and leave sufficient cable at all fittings or boxes.
- D. Keep minimum bending radii.
- E. Use UL listed wire-pulling lubricant for pulling #4 AWG and larger wires. Lubricant shall conform to UL requirements for both the insulation and raceway material.

3.02 CONDUCTOR SUPPORT

- A. Provide conductor supports as recommended by the NEC or cable manufacturer in vertical conduits.

3.03 SPLICING

- A. No splicing or joints will be permitted in either feeder or branch circuits except at outlet or accessible junction boxes. Utilize compression type solderless connectors when making splices or taps in conductors No. 8 AWG or larger. Utilize pre-insulated connectors, 3M Company "Scotchlok" or Ideal Industries, Inc. "Super Nut" for splices and taps in conductors No. 10 AWG and smaller. Tape all splices and joints with Scotch No. 88 plastic tape to secure insulation strength equal to that of the conductors joined. Keep splices in underground junction boxes, handholes, and manholes to an absolute minimum. Where splices are necessary, use resin splicing kits manufactured by the 3M Company, St. Paul, Minnesota to totally encapsulate the splice.

3.04 CONDUCTOR TERMINATION

- A. Stranded Conductors: Provide all power, control, communication and alarm conductors that terminate on equipment or terminal strips with compression type solderless lugs, T and B "Sta-Kon" terminals, or approved equal.
- B. #8 AWG and smaller Conductors: Use properly sized insulated spring wire connectors with plastic caps.
- C. #6 AWG and larger Conductors: Use crimp or compression type connectors installed with tool recommended by connection manufacturer and insulate with properly sized 600-volt rated heat shrink tubing.
- D. Wire Markers: Every wire termination, including all jumpers, shall be identified with wire markers. Wire markers shall be installed over wire terminators or directly adjacent to them. Markers shall be arranged to permit reading of identification.

3.05 CONDUCTOR PHASE COLOR CODING

- A. All service, feeder and branch circuit conductors throughout the project's secondary electrical system shall be color coded as follows:

<u>Phase</u>	<u>120/240VAC</u>
L1	Black
L2	Red
Neutral	White
Ground	Green/Bare

- B. Where color code conductors are not commercially available, colored non-aging plastic tape may be utilized when permitted by code.

END OF SECTION

SECTION 16130
OUTLET BOXES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products and methods of execution relating to outlet boxes for use with wiring devices and lighting fixture outlets approved for use on this project. All boxes shall be sized per NEC - Article 370.

1.02 RELATED REQUIREMENTS

- B. Section 16010 - General Electrical Provisions
- C. Section 16100 - Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. UL approval for intended usage shall constitute proof of acceptable quality.

PART 2 – MATERIALS

2.01 CAST BOXES

- A. Device boxes shall be Type FS or FSD as required.
- B. Boxes shall be equipped with mounting lugs, threaded hubs and gasketed covers and used in the following locations:
 - 1. All exterior locations;
 - 2. All wet or damp locations;
 - 3. Where exposed to mechanical damage;
 - 4. All exposed interior locations below 48 inches above floor;
 - 5. Where shown on Contract Drawings.

2.02 GALVANIZED PRESSED STEEL BOXES

- A. May be used wherever they are permitted by code, except in areas indicated in Paragraph 2.01 above.

2.03 GROUNDING SCREW

- A. All pressed steel boxes shall have a drilled and tapped hole in the back of the box for a grounding screw.

2.04 ACCESSORIES

- A. Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Outlet Boxes shall be securely fastened in position and supported independently of the conduit system.
- B. Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified elsewhere in other sections of the specifications.
- C. Provide the best suitable box for each outlet requirement.
- D. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.
- E. All boxes shall be accessible.

END OF SECTION

SECTION 16131
PULL AND JUNCTION BOXES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general provisions, products and methods of execution relating to pull and junction boxes approved for use on this project. Furnish all such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods
- C. Section 16130 - Outlet Boxes

1.03 QUALITY ASSURANCE

- A. Pull and junction boxes 150 cubic inches and smaller shall conform to Section 16130.
- B. Pull and junction boxes larger than 150 cubic inches shall conform to Underwriters Laboratory (UL) standard 50-1970, Cabinets and Boxes. The UL label shall constitute proof of acceptable quality.

PART 2 – MATERIALS

2.01 PULL AND JUNCTION BOXES

- A. Pull and junction boxes shall conform to Article 370 of the NEC and the following requirements:
 - 1. Sheet metal boxes shall be approved for use in all dry, interior, non-hazardous locations.
 - 2. Boxes exposed to rain or installed in wet locations shall be NEMA 4 or as noted.
 - 3. Boxes installed underground shall be either precast concrete or cast iron.
 - 4. Special boxes, as noted on the Plans, shall be installed in areas of specific service and/or hazards.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general provisions, products, and methods of execution relating to line voltage wiring devices approved for use on this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. Manufacturers mentioned and catalog numbers specified are for establishment of type, configuration, and quality. Other manufacturers and types may be submitted for approval.

PART 2 – MATERIALS

2.01 SWITCHES

- A. Provide wiring devices indicated. Catalog numbers shown are Leviton unless noted otherwise. Equal devices manufactured by Pass and Seymour, Slater, Bryant, Hubbell and G.E. are acceptable. Provide all similar devices of same manufacturer. Provide gray device color.
- B. Provide 20 AMP, 120/277V rated switches with Underwriters Laboratory approved for tungsten lamp loads or inductive loads without de-rating. Switches shall be as follows:
 - 1. Single Pole: Cat# CSB1-20G
 - 2. Three-Way: Cat# CSB3-20G
 - 3. 4-way: Cat# CSB4-20G
 - 4. Double-pole: Cat# CSB2-20G
- C. Switches requiring ratings and configurations different from those listed above shall be provided as shown on the Contract Drawings and/or required by the equipment served.

2.02 RECEPTACLES

- A. Provide ground fault interrupt type receptacles as follows, or as required to match equipment furnished in this or other Divisions.
 - 1. Weather proof, duplex receptacle.
 - 2. 20A-120V
 - 3. NEMA 5-20R

4. Indicator Light
 5. Leviton Cat# 8898-T or 7899-T
- B. Outlets requiring ratings and configurations different from those listed above shall be provided as shown on the Contract Drawings and/or required by the equipment served.

2.03 PLATES / COVERS

- A. Provide weatherproof cover plates for all exterior surface mounted wiring devices.
- B. Install blank covers on all boxes without devices or fixtures.
- C. Provide Stainless Steel plates for all flush mounted or interior wiring devices.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install all wiring devices indicated complete with cover plates. Cover plates shall fit snugly on box and line up true with adjacent building lines.
- B. All switches shall be installed so their handles move in a vertical plane.
- C. Door/gate swings shall be checked and, if necessary, switches shall be relocated to place them on the striker side of the door/gate on single door/gate installations.

END OF SECTION

SECTION 16160
MOTOR STARTERS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to manual and magnetic motor starters provided in this and other Divisions. Overloads shall be furnished and installed in Division 16.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. Equipment shall be of the latest approved designs manufactured by a nationally recognized manufacturer and in conformity with the governing NEMA standards.

PART 2 – MATERIALS

2.01 GENERAL

- A. Motor Starters: Provide full voltage starting, non-reversing, magnetic type motor starters, IEC rated, AC general-purpose, Class A, with magnetic controller for induction motors rated in horsepower. Overload relay shall be non-ambient sensitive. Provide two field convertible contacts in addition to seal-in contact. Install motor control equipment in accordance with manufacturer's instructions. Select and install heater elements or set adjustable overloads in motor starters to match installed motor characteristics.
- B. Motor Data: Provide neatly typed label inside each motor starter or control panel enclosure door identifying motor(s) served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

2.02 AC MAGNETIC STARTERS - LINE VOLTAGE TYPE

- A. Motor starters shall be across-the-line magnetic type rated in accordance with NEMA standards, sizes and horsepower ratings.
- B. Starters shall be mounted in Local Control Panels or individually in their own NEMA rated enclosures as shown on the Contract Drawings.
- C. Starters shall be furnished with ambient compensated, Class 10, adjustable, overload relays in every phase conductor.
- D. Starters through NEMA size three shall be equipped with double break silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel.
- E. Coils shall be of molded construction and shall be 120VAC.
- F. Starters shall be suitable for the addition of at least four external electrical interlocks of any arrangement normally open or normally closed.

- G. All individually enclosed starters shall have enclosure mounted red running pilot light.

2.03 DISCONNECT SWITCHES

- A. Provide 250V heavy duty non-fusible quick-make, quick break, load interrupter, enclosed knife switches with externally operable handle interlocked to prevent opening front cover with switch in "ON" position. Handle lockable in "OFF" position.

2.04 ACCESSORIES

- A. Provide push-buttons, selector switches, pilot lights, elapsed time meters, etc., as indicated on the Contract Drawings or as required herein and elsewhere in these specifications. Device shall be standard components normally supplied from the factory with the starters.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Coordinate all details pertaining to the motor control equipment with the Division of these specifications where the equipment is specified.
- B. Align starters in control panels to permit logical location of mechanical reset pushbutton.

3.02 CONTROL WIRING

- A. Control wiring and control devices shall be provided under the specification section in which the controlled equipment is specified.

3.03 CONNECTIONS

- A. Provide flexible conduit or coupling connections to motors and other equipment subject to vibration. Minimum length 12 inches.

3.04 NAMEPLATES

- A. Provide nameplates for all starters. Coordinate names with mechanical equipment lists.

3.05 OVERLOAD PROTECTION

- A. Install overload protection. Verify that protection corresponds to motor full load current and that motors starts and operates properly.

END OF SECTION

SECTION 16164
PANELBOARDS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section includes furnishing and installing panelboards and combination meter/panels and related appurtenances, complete.

1.02 QUALITY ASSURANCE

- A. Meter panels and panelboards shall be UL listed and shall comply with the NEC.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data: Submit shop drawings and product data for the products of this section in compliance with Section 16010, General Electrical Provisions.
- B. Operation and Maintenance Manuals: Submit operation and maintenance manuals for the products of this section in compliance with Section 16010, General Electrical Provisions.

PART 2 – MATERIALS

2.01 NAMEPLATES

- A. Nameplates shall be provided for all relays, timers, transformers, fuses, terminal block, switches mounted internally, and other components that are mounted to the internal mounting panel.
- B. Nameplates shall be sized to the scale of the device to which they refer.
- C. The engraving shall be as shown for the device on the elementary wiring diagrams.

2.02 PANELBOARDS

- A. A nameplate shall be provided listing panel type and ratings.
- B. Bus bars for the mains shall be of copper, sized in accordance with UL standards. Unless otherwise noted, full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.
- C. The short circuit rating of the assembled panelboard shall be as indicated on the Contract Drawings and in accordance with UL standards and their test verification.
- D. All panelboards shall be fitted with an equipment ground bar.
- E. Boxes shall be rated for NEMA 3R environment. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides. Lighting panel boxes shall use three piece construction wrapper sheet for back and two sides with removable top and bottom ends.

- F. Hinged doors covering all switching device handles shall be included in all panel trims, except that panelboards having individual metal clad externally operable dead-front units may be supplied without such doors.
- G. Doors in panelboard trims shall conform to the following:
 - 1. In making switching device handles accessible, doors shall not uncover any live parts.
 - 2. Doors shall have flush-type cylinder lock and catch. Door hinges shall be concealed. All locks shall be keyed alike. A directory frame and card having a transparent cover shall be furnished on each door. Directory shall be typed, not handwritten.
 - 3. The trims shall be fabricated from code gauge sheet steel.
- H. All exterior and interior steel surfaces of the panelboard trims shall be properly cleaned and finished with ANSI-61 paint over a rust-inhibiting phosphatized coating.
- I. Breakers shall be rated as specified in Section 16180, Overcurrent Protective Devices.
- J. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" and carry SWD marking.

2.03 WIRE MARKERS

- A. Shall consist of white or yellow, slip-on elastic sleeves sized to tightly grip the wire insulation and marked in block printing with the letters or numbers to identify the circuit.

2.01 MANUFACTURERS

- A. Square D
- B. Cutler Hammer

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Set panelboards such that the highest operable switch is not more than 6 feet AFF.
- B. Update panel schedule after testing and installation is complete.

END OF SECTION

SECTION 16170
DISCONNECTS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to fusible and nonfusible disconnecting devices approved for use on this project.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods
- C. Section 16180 - Overcurrent Protective Devices

1.03 QUALITY ASSURANCE

- A. Devices shall be of the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with UL listings and the governing NEMA standards.

PART 2 – MATERIALS

2.01 SAFETY SWITCHES

- A. Provide 250V heavy duty non-fusible quick-make, quick break, load interrupter, enclosed knife switches with externally operable handle interlocked to prevent opening front cover with switch in on position, handle lockable in off position.
- B. Safety switches, fusible and nonfusible shall conform to NEMA Standards KSI-1969 for Type HD (Heavy Duty).
- C. Switch Interior: All switches shall have switch blades which are fully visible in the OFF position when the door is open. Switches shall be of dead-front construction with permanently attached arc suppressors. Lugs shall be UL listed for copper and/or aluminum cables and front removeable.
- D. Switch Mechanism: Switches shall have a quick-made and a quick-break operating handle and mechanism which shall be an integral part of the box, not the cover. Switches shall have a defeatable dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. The switch shall be capable of being locked in the OFF position with three padlocks.
- E. Enclosures: Switch enclosure shall be suitable for the environment in which the switch is mounted. NEMA 1 enclosure shall be code gauge, UL 98, sheet steel, treated with a rust inhibiting phosphate and finished in gray, baked enamel. NEMA 3R enclosure - same requirements as NEMA 1 except galvanized prior to painting. Special purpose enclosures such as NEMA 4, 5, 7 and 12, shall be cast aluminum or stainless steel.

- F. Rating: Ampere, volt and horsepower ratings, as well as number of poles and presence of neutral bar shall be shown on the nameplate.

2.02 CIRCUIT BREAKERS

- A. Circuit breakers used as disconnects shall meet requirements specified in Section 16180, Overcurrent Protective Devices. Enclosures for same shall meet the requirements as specified above.
- B. Breakers serving as disconnecting means shall be provided with lockable fittings

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Coordinate all details pertaining to size of equipment, and requirements to enclosures, ratings, etc., so as to provide the most suitable unit for the intended purpose.
- B. Provide nameplates for all disconnects. Coordinate names with mechanical equipment lists.

END OF SECTION

SECTION 16180
OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to overcurrent protective devices approved for use on this project. Type, duty rating and characteristics, fault interrupting capability and coordination requirements shall be determined from the Contract Drawings and the following specifications.

1.02 RELATED REQUIREMENTS

- B. Section 16010 - General Electrical Provisions
- C. Section 16100 - Basic Materials and Methods
- D. Section 16164 – Meter Panels and Panelboards
- E. Section 16170 - Disconnects

1.03 QUALITY ASSURANCE

- A. Devices shall be the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with applicable standards and UL listed.

PART 2 – MATERIALS

2.01 MOLDED CASE CIRCUIT BREAKERS

- A. Molded case circuit breakers shall be bolt-on thermal magnetic trip type with common trip handle for all poles.
- B. The breakers shall be suitable for individual as well as panelboard mounting. Bolt-on type, unless "plug-on" type specifically allowed.
- C. The breakers shall meet NEMA and/or UL specifications as applicable to frame and size, standard rating and interrupting capability.
- D. The breakers shall be one-, two-, or three-pole as scheduled, operate manually for normal ON-OFF switching and automatically under overload and short circuit conditions.
- E. Operating handle shall open and close all poles simultaneously on a multi-pole breaker. Operating mechanism shall be trip-free so that contacts cannot be held closed against abnormal overcurrent or short circuit condition.

2.02 FUSES

- A. Fuses of the sizes and types specified on the Contract Drawings shall be installed. Fuses shall be capable of interrupting the prospective symmetrical fault current. Furnish one complete set of spare fuses of each rating installed to the Owner. Provide fuse puller(s) for fuse sizes used.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Size devices as required by the load being served.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Support and align raceways, cabinets, boxes, fixtures, etc., in an approved manner and as specified.

1.02 RELATED REQUIREMENTS

- A. Section 16110 - Conduits and Fittings
- B. Section 16130 - Outlet Boxes
- C. Section 16500 - Lighting Fixtures

PART 2 – MATERIALS

2.01 GENERAL

- A. Support raceways on approved types of wall brackets, ceiling trapeze hangers, or malleable iron straps.
 - 1. "Kindorf", "Unistrut", or equal.
 - 2. Plumbers perforated strap not permitted as means of support.
 - 3. Support used for exterior equipment shall be galvanized or Stainless steel.
- B. Earthquake anchorages:
 - 1. Anchor equipment weighing more than 100 pounds to the building structure to resist lateral earthquake forces.
 - 2. Total lateral (earthquake) force shall be 1.00 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.
 - 3. Provide equipment supported by flexible isolation mounts with earthquake restraining supports positioned as close to equipment as possible without contact in normal operation (earthquake bumpers). The maximum lateral displacement due to the computed earthquake force from above shall not exceed 1.5 inches. Floor mounted equipment weighing less than 2000 pounds may have one 6-inch by 6-inch by 3/8-inch by 18-inch steel angle bolted to the floor with four 5/8-inch diameter bolts placed on each of four sides of the equipment.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Provide all bracing as required to securely mount enclosures, fixtures and devices.

- B. Unless otherwise noted, all materials used shall be hot dipped galvanized hardware and galvanized formed steel components such as Unistrut or equal. Where support elements are field cut, exposed metal shall be coated with spray-on galvanizing.
- C. Conduits and equipment shall be mounted using unistrut or similar supports unless otherwise noted.
- D. Support from structure only.
- E. When bolting to structure, verify that the original structure and performance (i.e. water tight) characteristics are maintained.
- F. Do not strap conduits to fuel piping. When run in parallel with exposed fuel piping maintain adequate separation to allow maintenance to take place on either piping of conduit system so that the other does not have to be removed when maintenance is required.
- G. Where conduits are buried (parallel) with fuel piping maintain a minimum 1-foot separation.
- H. Conduits shown to be run at grade shall be supported every 10 feet by wood sleepers as shown on the drawings. Conduits may share fuel piping sleepers if installed such that neither system will require removal during maintenance or replacement.

END OF SECTION

SECTION 16450
GROUNDING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to the furnishing and installation of a grounding system complete as required for this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods

1.03 MINIMUM REQUIREMENTS

- A. The minimum requirement for the system shall conform to Article 250 of the NEC.
- B. Unless specified elsewhere, the ohmic values for grounds and grounding systems shall be as follows.
 - 1. For grounding metal enclosures and frames for electrical and electrically operated equipment: 5 ohms maximum.
 - 2. For grounding systems to which electrical utilization equipment and appliances are connected: 5 ohms maximum.
 - 3. For grounding secondary distribution systems, neutrals, noncurrent carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel: 10 ohms maximum.
 - 4. For individual transformer and lightning arrester grounds on distribution systems: 10 ohms maximum.
 - 5. For equipment not covered in the above: 10 ohms maximum

PART 2 – MATERIALS

2.01 GROUND RODS, CONDUCTORS AND APPURTENANCES

- A. All ground rods and conductors for ground systems shall be as follows:
 - 1. Ground rods to be 3/4-inch by 10-foot copper clad steel.
 - 2. Grounding conductor for building service ground to be #4 AWG bare copper.
 - 3. Ground ring shall be #2 AWG bare copper.

4. Tank and fence grounds shall be as noted on the drawings. If not shown, #6AWG copper is the minimum size. Bond in accordance with manufacturer's requirements.

2.02 CONNECTIONS

- A. Joints in grounding conductors and mats below grade shall be made with solderless compression connections or with AMPACT TAP equipment. Terminations above grade shall be made with solderless lugs, securely bolted in place.

PART 3 – EXECUTION

3.01 SERVICE GROUND

- A. Provide Service Ground.
- B. Create an equipotential plane for the grounding system for this project at the service entrance equipment by connecting the following to a service entrance ground bar:
 1. The commercial system's grounded neutral conductor.
 2. All "man-made" grounds specified to be installed.
 3. The service entrance board and/or main disconnect and all conduits entering and leaving the board/disconnect.
 4. Other items or equipment called for on the Contract Drawings.
- C. Current carrying capacity of the grounding and bonding conductors shall be in conformity with Table 250-94 of the NEC.
- D. All structure and tank bonding shall be in accordance with manufacturer's recommended practice.

3.02 EQUIPMENT GROUND

- A. The raceway system shall be bonded in conformity with NEC requirements to provide a continuous ground path. Where required by code or where called for on the Contract Drawings, an additional grounding conductor shall be sized in conformity with Table 250-95 of the NEC.
- B. Provide separate grounding conductor securely bonded and effectively grounded to both ends of all non-metallic raceways and all flexible conduit.
- C. Provide ground rings for the BFU, individual Intermediate tanks and the Dispenser enclosure. The individual ground rings at the BFU site shall be bonded to each other and to the service ground.
- D. Each fuel tank shall be bonded to the ground at two separate locations.
- E. If non-metallic enclosures are provided, all metal conduits terminating or entering the enclosure shall be bonded together with approved bonding bushings and #6 AWG copper cable.
- F. Fences shall be bonded to the equipment ground.

3.03 SUBMITTAL DATA

- A. Provide typewritten report on the ground test for each ground system installed under this contract.

END OF SECTION

SECTION 16500
LIGHTING FIXTURES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to lighting fixtures approved for use on this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods
- C. Section 16550 - Lamps, Ballasts, Accessories

1.03 QUALITY ASSURANCE

- A. The fixture shall be a standard cataloged item as described on the Contract Drawings and as made by a nationally recognized manufacturer and UL approved.

1.04 SUBMITTALS

- A. Submit per Section 16010.

PART 2 – MATERIALS

2.01 GENERAL

- A. Provide fixtures or approved equal as shown on the Contract Drawings and as described in the Fixture Schedule.
- B. Provide lighting fixtures complete, wired, assembled, with proper flanges, mounting supports, hardware, etc.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Fixture Installation: Install fixtures per the Contract Drawings.
- B. Cleaning: After construction of total project is completed, wash dirty luminaires inside and out with a non-abrasive mild soap or cleaner. Clean luminaire plastic lenses with antistatic cleaners only. Touch up all painted surfaces of luminaires with high-grade exterior enamel.

3.02 EXTERIOR FIXTURES

- A. Exterior fixtures, supports and pole assemblies shall be capable of withstanding 100 mph winds with 30% gust factor with no damage.

END OF SECTION

SECTION 16550
LAMPS, BALLASTS, AND ACCESSORIES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes general requirements, products, and methods of execution relating to lamps, ballasts and related products approved for use on this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials and Methods
- C. Section 16500 - Lighting Fixtures

1.03 QUALITY ASSURANCE

- A. Products specified in this section shall be as manufactured by a nationally recognized manufacturer.

1.04 SUBMITTALS

- A. Lamps, ballasts and related products are generally included in the fixture schedule on the Plans. The Contractor shall verify that the fixture types submitted for approval contain components complying with the product specifications of this section.

PART 2 – MATERIALS

2.01 HID LAMPS

- A. High Pressure sodium lamps shall be clear, size and orientation as required by the fixture specified. PHILLIPS, SYLVANIA or equal.

2.02 INCANDESCENT LAMPS

- A. Incandescent lamps shall be extended life (A/99) with a design voltage of 130 volts, suitable for operating between 120 and 130 volts.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 16900
CONTROL / ALARM PANELS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section describes specific requirements, products, and methods of execution relating to the construction and furnishing of Control/Alarm panels used on this project.

1.02 RELATED REQUIREMENTS

- A. Section 16010 - General Electrical Provisions
- B. Section 16100 - Basic Materials And Methods
- C. Section 16120 - Wire and Cable

1.03 QUALITY ASSURANCE

- A. All Control/Alarm panels shall be listed or labeled per Section 16100, Basic Materials and Methods.

1.04 SUBMITTALS

- A. In addition to the requirements stated elsewhere in these Specifications, the following items shall be included in the submittal:
 - 1. Quality Assurance: State how supplier intends on satisfying the Listing/Labeling requirements in Paragraph 1.03 above.
 - 2. Components: Include a listing of all components provided in or on the panel. List shall include the components labeling (or listing) installation instructions, allowable ambient environment, and operation characteristics. "Cut" sheets are an acceptable format if all required data is presented in a readable manner. Where options are identified as available but not provided, they shall be marked out. Alternately identify only those options intended to be supplied with the component. If none, then state so on the submittal.
 - 3. Panels provided shall be listed or labeled as an electrical assembly by an agency acceptable to the State of Alaska Department of Labor – Mechanical Inspections Division.
- B. Environmental Calculations: Provide calculations verifying that allowable component environment will not be exceeded or will be maintained via heating/cooling and the manner with which the environment will be maintained.
- C. Shop Drawings and Product Data: Submit shop drawings and product data for the products of this section in compliance with Section 16010, General Electrical Provisions and as described here.
 - 1. Manufacturer's technical data for each control device.

2. Indicate dimensions, capacities, performance characteristics, electrical characteristics, and finishes for materials for each type of product indicated.
 3. Installation and startup instructions for each type of product indicated.
 4. Each control device shall be labeled with setting or adjustable range of control.
 5. Data to be included in the control panel shop drawings shall include:
 - a. Dimensioned operator door and back panel layout showing all components.
 - b. Bill of Materials with manufacturer and relevant part numbers.
 - c. Schematic diagram of power, signal and control wiring.
 - d. Differentiate between manufacturer-installed and field-installed wiring.
 - e. Details of control panel faces, including controls, instruments and labeling.
 - f. Terminal assignments with all external component terminations shown.
 - g. Detail equipment assemblies and indicate dimensions, weights, loads, required clearance, method of field assembly, components, and location and size of each field connection.
 - h. Written description of sequence of operation
 - i. Maintenance data shall include:
 - i. Maintenance instructions and lists of spare parts for each type of control device.
 - ii. Interconnection wiring diagrams with identified and numbered system components and devices.
 - iii. Step-by-step procedures indexed for each operator function.
 - iv. Inspection period, cleaning methods, cleaning materials recommended.
 - v. Calibration tolerances, calibration records and list of set points.
- D. As-built and Record Drawings: Submit as-built and record drawings for the work in this section in compliance with Section 16010, General Electrical Provisions, and as described here.
1. Upon receipt of approved submittals and after construction of the panel(s), prepare As-built drawings using the approved submittal files.
 2. Submit three (3) sets of full size drawings enclosed within each panel and a CD with a copy of Autocad files (22x34 drawing size) of the submittal drawings edited to as-built status.
 3. Provide one (1) CD for each panel.
- E. Operation and Maintenance (O&M) Manuals: Submit operation and maintenance manuals for the products of this section in compliance with Section 16010, General Electrical Provisions, and as described here.
1. Provide as-built versions of the project record documents, current price and source for all replaceable components (i.e. plug-in relays, pilot light lamps, etc.).

2. If a common component is used in several panels, a single cut sheet / descriptor is acceptable if all applicable panels are annotated on the submittal.
 3. All prepared O&M material shall be typed in MS Word (.doc) or scanned and converted to Adobe (.pdf) format. O&M data for each panel can be furnished on the same CD with the as-built drawings.
- F. Submit all electronic media including cut sheets, O&M information and instructions in either MS Word (.doc) or Adobe (.pdf) format on a CD formatted for reading on Intel-based PCs (not MAC).
- G. Construction shall proceed only after the Authority or their representative approves the required submittals.

PART 2 – MATERIALS

2.01 ENCLOSURES

- A. Enclosures
1. In all non-hazardous interior areas enclosures shall be NEMA 12.
 2. Enclosures shall be wall or rack mounted. Internal control components shall be mounted on a removable mounting pan. Mounting pan shall be finished white.
- B. Enclosure interior shall be provided with a steel back for mounting of control and power distribution components.
- C. Enclosure dimensions shall be based on door mounted component size and layout, components contained within, including terminal strips and wiring gutter.
- D. Enclosures shall be insulated and internal heating supplied to maintain temperatures 10F above the highest minimum operating temperature of any of the components installed in the panel and to mitigate condensation.

2.02 CONTROL PANELS (CP)

- A. The CONTRACTOR shall furnish the CP(s) to satisfy the functional requirements on the drawings. Each CP shall be fabricated with UL labeled components and the CP's shall be Listed as Assemblies. Panels not specifically specified as being provided in other Sections of the Specification shall be furnished and installed under this Section. All panels shall be wired under this Section.
- B. The CP controls shall be 120 volt maximum. Control conductors shall be Class C stranded copper, #14AWG minimum, with Type SIS or MTW insulation, 600V rating.
- C. Each CP shall be provided with identified terminal strips for the connection of all external conductors. The CONTRACTOR shall provide sufficient terminal blocks to connect 25 percent additional conductors for future use. Termination points shall be identified in accordance with the Contract Drawings. The terminal strip listed shows only external connections and internal numbering is to be provided by the manufacturer. All equipment associated with the CP(s) shall be ready for service after connection of conductors to equipment, controls, and CP(s).

- D. All internal wiring shall be factory-installed and, along with all field wiring, shall be contained in plastic raceways or troughs having removable covers. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals.
- E. The control power disconnect shall have a door-mounted handle unless otherwise specified or shown.
- F. Identification of panel-mounted devices, conductors, and electrical components shall meet the requirements specified elsewhere.
- G. All panel-mounted devices shall be mounted a minimum of 3 feet above finished floor elevation.
- H. Wiring within the panel shall be labeled with wire numbers and run in wiring duct, neatly tied and bundled with tie wraps or similar materials.

2.03 CP COMPONENTS

- A. As listed on the Contract Drawings

2.04 CONDUCTOR INSULATION

- A. Color coding of insulation shall be:
 - 1. Black: Undergrounded line, Load and Control conductors at line voltage.
 - 2. Red: Undergrounded AC Control conductors, at less than line voltage.
 - 3. Blue: Undergrounded DC Control conductors.
 - 4. Yellow: Undergrounded Control circuit conductors that may remain energized when the main disconnecting means is in the "OFF" position. These conductors shall be yellow throughout the entire circuit, including wiring in the control panel and the external field wiring.
 - 5. White or Natural Gray: Grounded Circuit conductor.
 - 6. White with Blue Stripe: Grounded (current-carrying) DC Circuit conductors.

2.05 WIRE MARKERS

- A. Shall consist of white or yellow, slip-on elastic sleeves sized to tightly grip the wire insulation and marked in block printing with the letters or numbers to identify the circuit.

2.06 TERMINAL BLOCKS

- A. Shall be Allen Bradley 1492 series or equal. Power terminations for supply and motor loads a maximum rating of 600 volts AC and 35 amps. Control and sensor terminals shall be determined by the manufacturer and based on upstream over current protection, fault duty etc. When individual devices or component terminal blocks are encountered with screw terminals, termination shall be by slip on spade tongue insulated compression terminators.

2.07 NAMEPLATES

- A. Shall be installed plumb and parallel to the lines of doors or structure to which they are attached.
- B. Provide nameplate for each panel.
- C. Panel nameplate shall be 2"x6" minimum size with 1/2-inch minimum engraved letters. Engraving shall be as shown on the Contract Drawings for the identification of each panel.

2.08 FACTORY TESTING

- A. Each CP shall be factory assembled, and tested for sequence of operation prior to job site delivery.
- B. Factory test shall be scheduled and AUTHORITY and ENGINEER notified 2 weeks prior to testing.
- C. Factory testing shall be with witnessed by ENGINEER.
- D. All panels to be provided for this project shall be tested during the same session.
- E. Factory test will be witnessed by the ENGINEER or other AUTHORITY - designated representative. Panels may not be shipped until tests are completed to the ENGINEER's approval. Approval must be in writing.
- F. If panel manufacturer is outside of the state, all expenses required to bring the ENGINEER or AUTHORITY'S representative to the manufacturer's facility shall be borne by the Contractor.

2.09 SPARE PARTS

- A. Provide a minimum of 10% spare lamps (minimum 2) and one spare lens for each color pilot lamp in each panel.
- B. For each panel, provide 1 each relay, motor starter, contactor, switch and pushbutton of types contained within that panel. Components shall be delivered to AUTHORITY in original shipping boxes suitable for long term storage.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. CP(s) shall be installed in accordance with the requirements specified Division 16 and in accordance with the Manufacturer's recommendations.
- B. CP(s) shall be protected at the job site from loss, damage, and the effects of weather. CP(s) shall be stored in an indoor, dry location. Heating shall be provided in areas subject to corrosion, and humidity.
- C. CP(s) interiors, and exteriors shall be cleaned, and coatings shall be touched up to match original finish upon completion of the work.
- D. Conduit, conductors, and terminations shall be installed in accordance with the requirements specified elsewhere.

3.02 FIELD TESTING

- A. Functional Test
 - 1. Panel operation will be demonstrated after all components and sensors associated with each panel have been installed and individually tested and calibrated or adjusted.
 - 2. The demonstration shall be witnessed by ENGINEER or other designated AUTHORITY representative.
 - 3. AUTO functions may be tested with simulated inputs. Input to be enabled as near to the actual device as possible, i.e., at the float terminals in the case of float controls.
- B. Panel functions to be tested include all manual and automatic functions, all alarms and status displays and the emergency shutdown where installed. The Functional Narratives and Operational Instructions on the drawings will form the basis of the operational test.
- C. Acceptance.
 - 1. Contractor will repair, replace as necessary components/sensors that fail. Testing will be repeated until panels are accepted.
 - 2. Travel, labor and subsistence costs for subsequent trips to the project site to test the panels shall be borne by the Contractor.

END OF SECTION