

Project Manual For:

**Nikolai and Venetie Power System and  
Bulk Fuel Upgrade Projects  
Project No. 22021**



**State of Alaska  
Alaska Energy Authority  
813 W Northern Lights Blvd, Anchorage, Alaska 99503**

**Advertising Date: November 4, 2021**

This page is blank intentionally.

**DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS**

<u>Section No.</u>		<u>Form</u>	<u>Date</u>
<u>Invitation</u>			
00 02 00	INVITATION TO BID	25D-7	(8/01)
<u>Bid Notices</u>			
00 10 00	INFORMATION TO BIDDERS	25D-3	(7/88)
00 10 10	SUPPLEMENTARY INFORMATION TO BIDDERS		(11/92)
00 11 50A	SPECIAL NOTICE TO BIDDERS		
00 12 00	REQUIRED DOCUMENTS	25D-4	(4/12)
<u>Forms</u>			
00 12 90	FEDERAL EEO BID CONDITIONS	25A-301	(8/01)
00 14 40	EEO-1 CERTIFICATION	25A-304	(8/01)
00 31 00	PROPOSAL	25D-9A	(07/03)
00 32 00	BID SCHEDULE		
00 41 00	BID BOND	25D-14	(8/01)
00 42 00	BID MODIFICATION	25D-16	(8/01)
00 43 00	SUBCONTRACTOR LIST	25D-5	(10/12)
00 51 00	CONSTRUCTION CONTRACT	25D-10A	(8/01)
00 61 00	PERFORMANCE BOND	25D-13	(8/01)
00 62 00	PAYMENT BOND	25D-12	(8/01)
00 67 00	CONTRACTOR'S QUESTIONNAIRE	25D-8	(8/01)
<u>Contract Provisions and Specifications</u>			
00 70 00	GENERAL CONDITIONS		
00 80 00	SUPPLEMENTARY CONDITIONS		
00 90 00	FEDERAL TERMS AND CONDITIONS		

**DIVISION 01 – GENERAL REQUIREMENTS**

- Section 01 11 13 - Summary of Work
- Section 01 12 19 - Contractors Certification of Subcontracts
- Section 01 12 19 - Sub Cert Form
- Section 01 26 63 - Change Procedures
- Section 01 26 63A - RFI Form
- Section 01 26 63B - CO Request Form
- Section 01 26 63C - Directive Form

Section 01 29 73 - Schedule of Values  
Section 01 29 76 - Application for Payment  
Section 01 31 19 - Project Meetings  
Section 01 32 16 - Construction Progress Schedule  
Section 01 32 26 - Construction Progress Reporting  
Section 01 33 00 - Submittal Procedures  
Section 01 33 23 - Shop Drawings, Product Data, and Samples  
Section 01 42 19 - Reference Standards  
Section 01 32 26 - Construction Progress Reporting  
Section 01 45 00 - Quality Control  
Section 01 51 00 - Construction Facilities  
Section 01 60 00 - Material and Equipment  
Section 01 60 00A - Substitution Request Form  
Section 01 71 13 - Mobilization and Demobilization  
Section 01 71 23.16 - Construction Surveying  
Section 01 73 00 - Execution Requirements  
Section 01 74 00 - Cleaning and Waste Management  
Section 01 77 00 - Contract Closeout Procedures  
Section 01 77 00A - Certificate of Substantial Completion  
Section 01 78 39 - Project Record Documents

## **DIVISION 02 - 33 - TECHNICAL SPECIFICATIONS**

Section 02 32 00 - Geotechnical Investigations  
Section 02 41 00 - Demolition  
Section 02 61 13 - Excavation and Handling of Contaminated Material  
Section 02 80 10 - Decommission Fuel Storage Tanks  
Section 03 30 00 - Cast-In Place Concrete  
Section 05 12 10 - Structural Steel Framing and Fabrications  
Section 06 10 00 - Rough Carpentry  
Section 06 17 53 - Shop Fabricated Wood Trusses  
Section 07 21 00 - Thermal Insulation  
Section 07 41 13 - Formed Metal Roof Panels  
Section 07 42 13 - Formed Metal Wall Panels  
Section 07 43 13 - Formed Vented Soffit Panels  
Section 07 43 23 - Insulated Metal Wall Panels  
Section 08 00 10 - Doors and Windows

Section 09 91 00 - Painting  
Section 11 95 13 - Spill Response Equipment  
Section 21 13 30 - High Pressure Water Mist Fire Suppression  
Section 23 05 00 - Common Work Results for Mechanical  
Section 23 05 29 - Hangers and Supports for Piping and Equipment  
Section 23 07 19 - Piping Insulation  
Section 23 09 00 - Instrumentation and Control Devices  
Section 23 11 13 - Power Plant Fuel-Oil Piping  
Section 23 11 14 - Power Plant Direct Bury Fuel Piping  
Section 23 12 13 - Power Plant Fuel-Oil Equipment and Specialties  
Section 23 21 13 - Hydronic Piping  
Section 23 21 16 - Hydronic Equipment and Specialties  
Section 23 31 13 - Metal Ducts and Ventilation Equipment  
Section 23 35 17 - Engine Exhaust Crank Vent and Charge Air Systems  
Section 26 05 00 - Common Work Results for Electrical  
Section 26 05 02 - Basic Electrical Materials and Methods  
Section 26 05 26 - Grounding and Bonding for Electrical Systems  
Section 26 05 29 - Hangers and Supports for Electrical Systems  
Section 26 05 33 - Raceway and Boxes for Electrical Systems  
Section 26 05 53 - 26 05 53 - Identification for Fuel Oil and Gasoline Electrical Systems  
Section 26 09 20 - Fuel Oil and Gasoline Panel  
Section 26 23 00 - Prime Power Switchgear  
Section 26 23 05 - SCADA System for Prime Power Switchgear  
Section 27 05 10 - Communications and Data Service  
Section 31 11 00 - Clearing and Grubbing  
Section 31 23 00 - Excavation and Fill  
Section 31 23 19 - Dewatering and Control of Surface Water  
Section 31 23 33 - Trenching and Backfill For Utilities  
Section 32 05 09 - Geotextile and Geomembrane Fabrics  
Section 32 31 13 - Chainlink Fences and Gates  
Section 33 05 00 - Common Work Results for Utilities  
Section 33 52 13 - Liquid Fuel Piping and Equipment  
Section 33 52 23 - Bulk Fuel Transfer Pumps  
Section 33 56 13 - Aboveground Fuel Storage Tanks  
Section 33 61 14 - PEX Arctic Pipe  
Section 33 61 24 - Steel Arctic Pipe

Section 33 71 01 - Overhead Electrical Distribution  
Section 33 71 02 - Underground Electrical Distribution  
Section 33 71 11 - Overhead Distribution Conductors  
Section 33 71 16 - Wood Electrical Utility Poles  
Section 33 73 01 - New Overhead Liquid-Filled Transformers  
Section 33 73 04 - Remanufactured Padmount Liquid-Filled Transformers

**DRAWINGS (Bound Separately)**

Nikolai Power System Upgrade Drawings  
Venetie Power System Upgrade Drawings  
Venetie Power System Upgrade Staking Sheets  
Venetie Bulk Fuel Upgrade Drawings

**END TABLE OF CONTENTS**

ALASKA ENERGY AUTHORITY

**INVITATION TO BID**

for Construction Contract

Date November 4, 2021

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

Location of Project: Nikolai and Venetie, Alaska  
Contracting Officer: Selwin Ray  
Issuing Office: ALASKA ENERGY AUTHORITY (AUTHORITY)  
State Funded [  ] Federal Aid [  ]

Description of Work: This Denali Commission and State appropriation funded contract is for the installation of new electrical power generation systems, upgrade of electrical power distribution systems, and installation of a new bulk fuel system in the communities of Nikolai and Venetie, Alaska as described herein and shown in the Drawings. The Contractor shall furnish all labor, materials, supervision, equipment, tools, transportation, quality control, and supplies required to complete the work.

The Engineer's Estimate is between **\$6,000,000 and \$9,000,000**

All portions of the work shall be substantially completed by dates indicated in Section 01 11 13 - Summary of Work.

Bidders are invited to submit single bid, for furnishing all labor, equipment, and materials and for performing all work for the project described above. Bids will be opened publicly on **December 2, 2021** at **2:00 pm** local time, **Due to the COVID-19 the bid opening will be conducted telephonically.** Potential bidders may attend telephonically by calling **1-888-585-9008** and when prompted enter **351 122 943#**.

**SUBMISSION OF BIDS**

ALL BIDS INCLUDING ANY AMENDMENTS OR WITHDRAWALS MUST BE RECEIVED PRIOR TO BID OPENING. BIDS SHALL BE SUBMITTED ON THE FORMS FURNISHED AND MUST BE MARKED AS FOLLOWS:

<b>Bid for Project:</b> <b>Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects</b> <b>Project Number: 22021</b>	<b>ATTN: Selwin Ray, Contract Administrator</b> <b>Alaska Energy Authority</b> <b>813 West Northern Lights Blvd.</b> <b>Anchorage, AK 99503</b>
---	--

**Mailed Bids**, amendments or withdrawals transmitted must be received in the above specified post office box no later than 4 hours prior to the scheduled time of bid opening. **Hand-delivered bids**, amendments or withdrawals must be received in the **Bid Drop Box in front of the Alaska Energy Authority**, prior to the scheduled time of bid opening. **Emailed bid** amendments or withdrawals must be received in the email inbox prior to the scheduled time of bid opening, addressed to **Selwin Ray**, Email: [sray@aidea.org](mailto:sray@aidea.org)

*A bid guaranty is required with each bid in the amount of 5% of the amount bid. (Alternate bid items as well as supplemental bid items appearing on the bid schedule shall be included as part of the total amount bid when determining the amount of bid guaranty required for the project.)*

The Authority hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this Invitation, Disadvantaged Business Enterprises (DBEs) will be afforded full opportunity to submit bids and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

## NOTICE TO BIDDERS

Bidders are hereby notified that data to assist in preparing bids is available as follows:

See attached Special Notice to Bidders for this project.

Electronic Plans and Specifications may be ordered, for the price of **\$0.00** from:

**Alaska Energy Authority**  
**813 West Northern Lights Blvd.**  
**Anchorage, AK 99503**

Phone: (907) 771-3035

All questions relating to design features, constructability, quantities, or other technical aspects of the project should be directed to the following. Bidders requesting assistance in viewing the project must make arrangements at least 48 hours in advance with:

**Rebecca Garrett, Project Manager** Phone: (907) 771- 3042 Email: [rgarrett@akenergyauthority.org](mailto:rgarrett@akenergyauthority.org)

All questions relating to bidding procedures should be directed to:

**Selwin Ray**  
**Contract Administrator**  
**813 West Northern Lights Blvd.**  
**Anchorage, AK 99503**

Phone: (907) 771-3035 Email: [sray@aidea.org](mailto:sray@aidea.org)

The Bid Calendar, Planholder lists, and Bid Results information are available on the Internet at:  
<http://www.akenergyauthority.org/> under **Procurement Opportunities**.

**Reminder: 3 AAC 109.220 requires all Bidders to have a valid Alaska Business License and an Alaska Contractor's Certificate of Registration prior to award.**

**ALASKA ENERGY AUTHORITY**  
**INFORMATION TO BIDDERS**

The Authority is concerned over the manner in which bids are submitted. Bidders are requested to study and follow the bid assembly instructions as to the method and form for submitting bids so there will be no reason to reject a bid.

**EXAMINATION OF CONTRACT REQUIREMENTS**

Bidders are expected to examine carefully the plans, specifications and all other documents incorporated in the contract to determine the requirements thereof before preparing bids.

Any explanation desired by bidders regarding the meaning or interpretation of drawings and specifications must be requested in writing and with sufficient time allowed for a reply to reach them before the submission of their bids. Oral explanations or instructions given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the specifications or drawings and will be furnished to all bidders and its receipt by the bidder shall be acknowledged.

**CONDITIONS AT SITE OF WORK**

Bidders are expected to visit the site to ascertain pertinent local conditions such as the location, accessibility and character of the site, labor conditions, the character and extent of the existing work within or adjacent thereto, and any other work being performed thereon.

**PREPARATION OF BIDS**

- (a) Bids shall be submitted on the forms furnished, and must be manually signed in ink. The person signing the proposal must initial any erasures or changes made to the bid.
- (b) The bid schedule will provide for quotation of a price or prices for one or more pay items which may include unit price or lump sum items and alternative, optional or supplemental price schedules or a combination thereof which will result in a total bid amount for the proposed construction.  
  
Where required on the bid form, bidders must quote on all items and **THEY ARE WARNED** that failure to do so will disqualify them. When quotations on all items are not required, bidders should insert the words "no bid" in the space provided for any item not requiring a quotation and for which no quotation is made.
- (c) The bidder shall specify the price or prices bid in figures. On unit price contracts the bidder shall also show the products of the respective unit prices and quantities written in figures in the column provided for the purpose and the total amount of the proposal obtained by adding the amounts of the several items. All the figures shall be in ink or typed.
- (d) Neither conditional nor alternative bids will be considered unless called for.
- (e) Unless specifically called for, telegraphic or telefacsimile bids will not be considered.
- (f) Bid Schedule form should be enclosed in a separate sealed envelope and enclosed with all other bidding forms required at the opening.

## **BID SECURITY**

All bids shall be accompanied by a bid security in the form of an acceptable Bid Bond (Form 25D-14), or a certified check, cashier's check or money order made payable to the Alaska Energy Authority. The amount of the bid security is specified on the Invitation To Bid.

Bid Bonds must be accompanied by a legible Power of Attorney.

If the bidder fails to furnish an acceptable bid security with the bid, the bid shall be rejected as non-responsive. Telegraphic notification of execution of Bid Bond does not meet the requirements of bid security accompanying the bid. An individual surety will not be accepted as a bid security.

The Authority will hold the bid securities of the two lowest bidders until the Contract has been executed, after which they will be returned. All other bid securities will be returned as soon as practicable.

## **BIDDERS QUALIFICATIONS**

Before a bid is considered for award, the bidder may be requested by the Authority to submit a statement of facts, in detail, as to his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the contemplated work.

## **SUBMISSION OF BIDS**

Bids must be submitted as directed on the Invitation To Bid. Do not include in the envelope any bids for other work.

## **ADDENDA REQUIREMENTS**

The bid documents provide for acknowledgement individually of all addenda to the drawings and/or specifications on the signature page of the Proposal. All addenda shall be acknowledged on the Proposal or by telegram prior to the scheduled time of bid opening. If the bidder received no addenda, the word "None" should be shown as specified.

Every effort will be made by the Authority to insure that Contractors receive all addenda when issued. Addenda will be issued to the individual or company to whom bidding documents were issued. Addenda may be issued by any reasonable method such as hand delivery, mail, telefacsimile, telegraph, courier, and in special circumstances by phone. Addenda will be issued to the address, telefacsimile number or phone number as stated on the planholder's list unless picked up in person or included with the bid documents. It is the bidder's responsibility to insure that he has received all addenda affecting the Invitation To Bid. No claim or protest will be allowed based on the bidder's allegation that he did not receive all of the addenda for an Invitation To Bid.

All questions must be received 72 hours before the bid opening. Questions submitted after the deadline may be rejected by the Authority.

## **WITHDRAWAL OR REVISION OF BIDS**

A bidder may withdraw or revise a bid after it has been deposited with the Authority, provided that the request for such withdrawal or revision is received by the designated office, in writing, by telegram, or by telefacsimile, before the time set for opening of bids.

Emailed or telefacsimile modifications shall include both the modification of the unit bid price and the total modification of each item modified, but shall not reveal the amount of the total original or revised bids. Form 25D-16 shall be used to submit such modifications.

## **RECEIPT AND OPENING OF BIDS**

- (a) The Authority must receive all bids, including any amendment or withdrawal prior to the scheduled time of bid opening. Any bid, amendment, or withdrawal that has not actually been received by the Authority prior to the time of the scheduled bid opening will not be considered.
- (b) No responsibility will be attached to any officer or employee of the Authority for the premature opening of, or failure to open, a bid improperly addressed or identified.
- (c) The Authority reserves the right to waive any technicality in bids received when such waiver is in the interest of the State.

## **BIDDERS PRESENT**

At the time fixed for bid opening, bids will be publicly opened and read for the information of bidders and others properly interested, who may be present either in person or by representative. The amount of the bid and the name of the bidder shall be compiled and distributed as soon as possible after bid opening. Bids are not open for public inspection until after the Notice of Intent to Award is issued.

## **BIDDERS INTERESTED IN MORE THAN ONE BID**

If more than one bid is offered by any one party, by or in the name of his or their clerk or partner, all such bids will be rejected. A party who has quoted prices to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a bid directly for the work.

## **REJECTION OF BIDS**

The Authority reserves the right to reject any and all bids when such rejection is in the best interest of the State; to reject the bid of a bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature; to reject the bid of a bidder who is not, in the opinion of the Contracting Officer, in a position to perform the contract; and to reject a bid as non-responsive where the bidder fails to furnish the required documents, fails to complete required documents in the manner directed, or makes unauthorized alterations to the bid documents.

## **AWARD OF CONTRACT**

- (a) The letter of award, if the contract is to be awarded, will be issued to the lowest responsible and responsive bidder as soon as practical and usually within 40 calendar days after opening of proposals.
- (b) The successful bidder will be notified of the Authority's intent to award the contract and requested to execute certain documents, including the contract form and bonds.
- (c) The contract will be awarded to the successful bidder following receipt by the Authority of all required documents, properly executed, within the time specified in the intent to award. Failure to enter into a contract within the specified time shall be grounds for forfeiture of the bid security and consideration of the second low bidder for award.

## ALASKA ENERGY AUTHORITY

### SUPPLEMENTARY INFORMATION TO BIDDERS

This document modifies or adds to the provisions of Alaska Energy Authority's form 25D-3, INFORMATION TO BIDDERS.

Following subject area "REJECTION OF BIDS", add the following subject area:

#### "CONSIDERATION OF PROPOSALS

After the Proposals are opened and read, they will be compared on the basis identified on the bid schedule and the apparent low Bidder announced. The apparent low Bidder shall, within 5 working days following identification as the apparent low Bidder, submit a list of all firms with which the prime CONTRACTOR intends to execute subcontracts for the performance of the Contract. The list shall include the name, business address, Alaska business license number and contractor's registration number of each proposed Subcontractor.

Upon confirmation of the contents of the proposal the low Bidder will be identified by the AUTHORITY in writing. If the low Bidder differs from the apparent low Bidder then the requirements for Subcontractor listing, as noted above, shall become effective upon the low Bidder at the time of identification.

If a Bidder fails to list a Subcontractor or lists more than one Subcontractor for the same portion of Work and the value of that Work is in excess of one-half of one percent of the total bid, the Bidder agrees that it shall be considered to have agreed to perform that portion of Work without the use of a Subcontractor and to have represented that the Bidder is qualified to perform the Work.

A Bidder who attempts to circumvent the requirements of this section by listing as a Subcontractor another contractor who, in turn, sublets the majority of the Work required under the Contract, violates this section.

If a Contract is awarded to a Bidder who violates this section, the Bidder agrees that the Contracting Officer may:

- (1) cancel the Contract without any damages accruing to the State; or
- (2) after notice and a hearing, assess a penalty on the Bidder in an amount that does not exceed 10 percent of the value of the Subcontract at issue.

A Bidder may replace a listed Subcontractor who:

- (1) fails to comply with AS 08.18;
- (2) files for bankruptcy or becomes insolvent;
- (3) fails to execute a contract with the Bidder involving performance of the Work for which the Subcontractor was listed and the Bidder acted in good faith;
- (4) fails to obtain bonding;
- (5) fails to obtain insurance acceptable to the State;
- (6) fails to perform the Contract with the Bidder involving Work for which the Subcontractor was listed;
- (7) must be substituted in order for the prime CONTRACTOR to satisfy required State and Federal affirmative action requirements;
- (8) refuses to agree or abide with the bidder's labor agreement; or
- (9) is determined by the Contracting Officer to be nonresponsive."

Modify subject area "AWARD OF CONTRACT" as follows:

Subparagraph (a) substitute the word "generally" for the phrase "as soon as practical and"

Subparagraph (b) delete and substitute the following:

"All Bidders will be notified of the AUTHORITY's intent to Award the Contract and the successful Bidder will be requested to execute certain documents, including the Contract form and bonds."

### Special Notice to Bidders

1. A non-mandatory pre-bid meeting is scheduled for **November 18, 2021, 2:00 pm.** **Due to the COVID-19 the pre-bid meeting will be conducted telephonically.** Potential bidder may attend telephonically by calling **1-888-585-9008**, when prompted enter **351 122 943#**. If calling in, please be respectful of other callers and call from a phone that can be muted so as to cancel out background noise and the possibility of feedback. Contact the Contract Administrator, Selwin Ray, at (907) 771-3035 for more information. This is not a mandatory meeting, and there will not be a scheduled site visit prior to the bid opening.

## REQUIRED DOCUMENTS

**REQUIRED FOR BID.** Bids will not be considered if the following documents are not completely filled out and submitted at the time of bidding:

1. **Bid Form (Form 25D-9)**
  2. **Bid Schedule**
  3. **Bid Security**
  4. Any bid revisions must be submitted by the bidder prior to bid opening on the following form:  
**Bid Modification (Form 25D-16)**
- 

**REQUIRED AFTER NOTICE OF APPARENT LOW BIDDER.** The apparent low bidder is required to complete and submit the following document within 5 working days after receipt of written notification:

1. **Subcontractor List (Form 25D-5)**
- 

**REQUIRED FOR AWARD.** In order to be awarded the contract, the successful bidder must completely fill out and submit the following documents within the time specified in the intent to award letter:

1. **Construction Contract (Form 25D-10A)**
2. **Payment Bond (Form 25D-12)**
3. **Performance Bond (Form 25D-13)**
4. **Contractor's Questionnaire (Form 25D-8)**
5. **EEO-1 Certification (25A-304)**
6. **Certificate of Insurance (from carrier)**

## FEDERAL EEO BID CONDITIONS

### STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246). FOR ALL NON-EXEMPT FEDERAL AND FEDERALLY-ASSISTED CONSTRUCTION CONTRACTS TO BE AWARDED IN THE STATE OF ALASKA

1. Definitions. As used in these specifications:
  - a. “**Covered area**” means the geographical area described in the solicitation from which this contract resulted;
  - b. “**Director**” means Director, Office of Federal Contract Compliance Programs (OFCCP), United States Department of Labor (DOL), or any persons to whom the Director delegates authority;
  - c. “**Employer**” identification number” means the Federal Social Security number used on the Employer’s Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - d. “**Minority**” includes:
    - (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race);
    - (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (4) American Indian or Alaska Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the DOL in the covered area, either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades that have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Plan does not excuse any covered Contractor’s or subcontractor’s failure to make good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7(a) through 7(p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

Covered construction contractors performing construction work in geographical areas where they do not have a federal or federally-assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any OFCCP office or from federal procurement contracting officers.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period of an approved training program and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
  - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligations to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
  - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
  - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
  - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the DOL. The Contractor shall provide notice of these programs to the sources compiled under 7(b) above.
  - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendent, general foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and dispositions of the subject matter.
  - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
  - i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
  - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
  - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
  - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
  - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
  - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-used toilet, necessary changing facilities and necessary sleeping facilities shall be provided to assure privacy between the sexes.
  - o. Document and maintain a record of all solicitations of offers for subcontractors from minority and female construction contractors and suppliers, including circulations of solicitations to minority and female contractor associations and other business associations.
  - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations 7(a) through 7(p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any or more of its obligations under 7(a) through 7(p) of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.)
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunities. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic apprentice, trainees, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that the existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Programs).
16. The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
17. The Contractor shall provide written notification to the Department, for all subcontracts documents as follows: the name, address and telephone number of subcontractors and their employer identification number; the estimated dollar amount of the subcontracts; estimated starting and completion dates of the subcontracts; and the geographical area in which the contract is to be performed.  
  
This written notification shall be required for all construction subcontracts in excess of \$10,000 at any tier for construction work under the contract resulting from this project's solicitation.
18. As used in the Bid Notice, and in the contract resulting from this project's solicitation, the "covered area" is the State of Alaska.

STATE OF ALASKA  
ALASKA ENERGY AUTHORITY

**EEO-1 CERTIFICATION**

Federal- Contracts

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

This certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor [41 CFR 60-1.7 (b) (1)] and must be completed by the successful Bidder and each proposed Subcontractor participating in this contract.

**PLEASE CHECK APPROPRIATE BOXES**

The  Bidder  Proposed Subcontractor hereby CERTIFIES:

**PART A.** Bidders and proposed Subcontractors with 50 or more year-round employees and a federal contract amounting to \$50,000 or more are required to submit one federal Standard Report Form 100 during each year that the two conditions exist (50 employees and a \$50,000 federal contract).

The company named below (Part C) is exempt from the requirements of submitting the Standard Report Form 100 this year.

NO (go to PART B)  YES (go to PART C)

Instructions and blank Standard Report Form 100's may be obtained from a local U.S. Department of Labor office, or by writing to:

The Joint Reporting Committee  
P.O. Box 779  
Norfolk, Virginia 23501

Telephone number: (757) 461-1213

**PART B.** The company named below has submitted the Standard Report Form 100 this year.

NO  YES

**Note:** Bidders and proposed Subcontractors who have not filed the required Standard Report Form 100 and are not exempt from filing requirements will not be awarded this contract or subcontract until Form 100 has been filed for the current year ending June 30.

**PART C.**

\_\_\_\_\_  
Signature of Authorized Company Representative

\_\_\_\_\_  
Title

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Company Address (Street or PO Box, City, State, Zip)

\_\_\_\_\_  
Date

( )  
\_\_\_\_\_  
Phone Number

**PROPOSAL**  
of

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

**To the CONTRACTING OFFICER, ALASKA ENERGY AUTHORITY:**

In compliance with your Invitation To Bid dated **November 4, 2021**, the Undersigned proposes to furnish and deliver all the materials and do all the work and labor required in the construction of Project:

**Project Name**

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects**

**Project No. 22021**

Located at **Nikolai and Venetie, Alaska**, according to the plans and specifications and for the amount and prices named herein as indicated on the Bid Schedule consisting of 2 sheet(s), which is made a part of this Bid.

The Undersigned declares that he has carefully examined the contract requirements and that he has made a personal examination of the site of the work; that he understands that the quantities, where such are specified in the Bid Schedule or on the plans for this project, are approximate only and subject to increase or decrease, and that he is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the Contract Documents.

The Undersigned hereby agrees to execute the said contract and bonds within fifteen calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of this proposal, and it is hereby mutually understood and agreed that in case the Undersigned does not, the accompanying bid guarantee shall be forfeited to the Alaska Energy Authority, as liquidated damages, and the said Contracting officer may proceed to award the contract to others.

The Undersigned agrees to commence the work within 10 calendar days of the effective date of Notice to Proceed and to Substantially Complete the work by the **dates indicated in Section 01 11 13 - Summary of Work** unless extended in writing by the Contracting Officer.

The Undersigned proposes to furnish Payment Bond in the amount of 100% (of the contract) and Performance Bond in the amount of 100% (of the contract), as surety conditioned for the full, complete and faithful performance of this contract.

The Undersigned acknowledges receipt of the following addenda to the drawings and/or specifications (give number and date of each).

Addendum Number	Date Issued

Addendum Number	Date Issued

Addendum Number	Date Issued

**NON-COLLUSION AFFIDAVIT**

The Undersigned declares, under penalty of perjury under the laws of the United States, that neither he nor the firm, association, or corporation of which he is a member, has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

The Undersigned has read the foregoing proposal and hereby agrees to the conditions stated therein by affixing his signature below:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name and Title of Person Signing

\_\_\_\_\_  
Telephone Number

\_\_\_\_\_  
Fax Number

**BID SCHEDULE**

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

**Bidders Please Note:** Before preparing this bid schedule, read carefully, "Information to Bidders", and the following:

The Bidder shall insert a fixed price in figures opposite each pay item that appears on the bid schedule to furnish all labor, material, equipment, supervision and provide all work for each item listed. No price is to be entered or tendered for any item not appearing in the bid schedule. In case of error in the extension of prices in the bid, the unit prices will govern.

Contract award shall be made based on the Total Base Bid. AEA reserves the right to award none or any number of alternates in any order in the best interest of the State.

Bidders are required to bid on all bid items. Conditioned or qualified bids will be considered non-responsive.

<b>Bid Item</b>	<b>Description</b>	<b>Lump Sum Price</b>
1	Nikolai Power System Upgrade Base Bid	\$
2	Venetie Power System Upgrade Base Bid	\$
3	Venetie Bulk Fuel System Upgrade Base Bid	\$
<b>Total Base Bid</b>		\$
4	Nikolai Power System Upgrade Additive Alternate #1	\$
5	Nikolai Power System Upgrade Additive Alternate #2	\$
6	Nikolai Power System Upgrade Additive Alternate #3	\$
7	Nikolai Power System Upgrade Additive Alternate #4	\$
8	Venetie Power System Upgrade Additive Alternate #1	\$
9	Venetie Power System Upgrade Additive Alternate #2	\$

See Specification Section 01 11 13 Summary of Work and drawings for detailed descriptions of each bid item.

**2. Acknowledge all addenda**

<b>Addendum No</b>	<b>Date Issued</b>	<b>Addendum No</b>	<b>Date Issued</b>	<b>Addendum No</b>	<b>Date Issued</b>

**3. BIDDER'S NOTICE: By signature on this form, the Bidder certifies that:**

- a. The price(s) submitted are independent and without collusion.
- b. The Bidder will comply with the laws of the State of Alaska;
- c. The Bidder will comply with applicable portions of the Federal Civil Rights Act of 1964;
- d. The Bidder will comply with the Equal Employment Opportunity Act and the regulations issued there under by the State and Federal Government; and
- e. The Bidder has reviewed all terms and conditions in this Invitation to Bid.

**If any Bidder fails to comply with any of these requirements, the Authority may reject its bid, terminate the contract, or consider the Vendor in default.**

Company Submitting Bid	Telephone Number
Address	Fax Number
Authorized Signature	E-mail Address
Print Name	Alaska Business License number: _____ EXPRES DATE: _____
	Alaska Contractor's Registration # _____ EXPRES DATE: _____

**End of Bid Schedule.**

ALASKA ENERGY AUTHORITY

**BID BOND**

For

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

DATE BOND EXECUTED: \_\_\_\_\_

PRINCIPAL (Legal name and business address):

TYPE OF ORGANIZATION:

PRINCIPAL (Legal name and business address):	[ ] Individual                      [ ] Partnership [ ] Joint Venture                      [ ] Corporation
STATE OF INCORPORATION:	

SURETY(IES) (Name and business address):

<b>A.</b>	<b>B.</b>	<b>C.</b>
PENAL SUM OF BOND:		DATE OF BID:

We, the PRINCIPAL and SURETY above named, are held and firmly bound to the State (State of Alaska), in the penal sum of the amount stated above, for the payment of which sum will be made, we bind ourselves and our legal representatives and successors, jointly and severally, by this instrument.

THE CONDITION OF THE FOREGOING OBLIGATION is that the Principal has submitted the accompanying bid in writing, date as shown above, on the above-referenced Project in accordance with contract documents filed in the office of the Contracting Officer, and under the Invitation To Bid therefore, and is required to furnish a bond in the amount stated above.

If the Principal's bid is accepted and he is offered the proposed contract for award, and if the Principal fails to enter into the contract, then the obligation to the State created by this bond shall be in full force and effect.

If the Principal enters into the contract, then the foregoing obligation is null and void.

**PRINCIPAL**

Signature(s)	1.	2.	3.
Name(s) & Title(s) (Typed)	1.	2.	3.

Corporate Seal

See Instructions on Reverse

**CORPORATE SURETY(IES)**

<b>Surety A</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

<b>Surety B</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

<b>Surety C</b>	Name of Corporation	State of Incorporation	Liability Limit \$
Signature(s)	1.	2.	Corporate Seal
Name(s) & Titles (Typed)	1.	2.	

### INSTRUCTIONS

1. This form shall be used whenever a bid bond is submitted.
2. Insert the full legal name and business address of the Principal in the space designated. If the Principal is a partnership or joint venture, the names of all principal parties must be included (e.g., "Smith Construction, Inc. and Jones Contracting, Inc. DBA Smith/Jones Builders, a joint venture"). If the Principal is a corporation, the name of the state in which incorporated shall be inserted in the space provided.
3. Insert the full legal name and business address of the Surety in the space designated. The Surety on the bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. Individual sureties will not be accepted.
4. The penal amount of the bond may be shown either as an amount (in words and figures) or as a percent of the contract bid price (a not-to-exceed amount may be included).
5. The scheduled bid opening date shall be entered in the space marked Date of Bid.
6. The bond shall be executed by authorized representatives of the Principal and Surety. Corporations executing the bond shall also affix their corporate seal.
7. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.
8. The states of incorporation and the limits of liability of each surety shall be indicated in the spaces provided.
9. The date that bond is executed must not be later than the bid opening date.







**CONSTRUCTION CONTRACT**

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

This CONTRACT, between the ALASKA ENERGY AUTHORITY, herein called the Authority, acting by and through its Contracting Officer, and

\_\_\_\_\_  
**Company Name**

\_\_\_\_\_  
**Company Address (Street or PO Box, City, State, Zip)**

a/an  Individual  Partnership  Joint Venture  Sole Proprietorship  Corporation incorporated under the laws of the State of \_\_\_\_\_, its successors and assigns, herein called the Contractor, is effective the date of the signature of the Contracting Officer on this document.

WITNESSETH: That the Contractor, for and in consideration of the payment or payments herein specified and agreed to by the Department, hereby covenants and agrees to furnish and deliver all the materials and to do and perform all the work and labor required in the construction of the above-referenced project at the prices bid by the Contractor for the respective estimated quantities aggregating approximately the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), and such other items as are mentioned in the original Bid, which Bid and prices named, together with the Contract Documents are made a part of this Contract and accepted as such.

It is distinctly understood and agreed that no claim for additional work or materials, done or furnished by the Contractor and not specifically herein provided for, will be allowed by the Authority, nor shall the Contractor do any work or furnish any material not covered by this Contract, unless such work is ordered in writing by the Authority. In no event shall the Authority be liable for any materials furnished or used, or for any work or labor done, unless the materials, work, or labor are required by the Contract or on written order furnished by the Authority. Any such work or materials which may be done or furnished by the Contractor without written order first being given shall be at the Contractor's own risk, cost, and expense and the Contractor hereby covenants and agrees to make no claim for compensation for work or materials done or furnished without such written order.

The Contractor further covenants and agrees that all materials shall be furnished and delivered and all labor shall be done and performed, in every respect, to the satisfaction of the Authority, on or before,

Substantially Completed by: **Dates indicated in Section 01 11 13 - Summary of Work**  
Final Completion: **Dates indicated in Section 01 11 13 - Summary of Work**

It is expressly understood and agreed that in case of the failure on the part of the Contractor, for any reason, except with the written consent of the Authority, to complete the furnishing and delivery of materials and the doing and performance of the work before the aforesaid date, the Authority shall have the right to deduct from any money due or which may become due the Contractor, or if no money shall be due, the Authority shall have the right to recover **Five Hundred Dollars (\$500.00)** per day for each calendar day elapsing between the time stipulated for the completion and the actual date of completion in accordance with the terms hereof; such deduction to be made, or sum to be recovered, not as a penalty but as liquidated damages.

The bonds given by the Contractor in the sum of \$ \_\_\_\_\_ Payment Bond, and \$ \_\_\_\_\_ Performance Bond, to secure the proper compliance with the terms and provisions of this Contract, are submitted herewith and made a part hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contract and hereby agree to its terms and conditions.

---

**CONTRACTOR**

---

**Company Name**

---

**Signature of Authorized Company Representative**

---

**Typed Name and Title**

---

**Date**

(Corporate Seal)

---

**ALASKA ENERGY AUTHORITY**

---

**Signature of Contracting Officer**

---

**Typed Name**

---

**Date**

ALASKA ENERGY AUTHORITY

**PERFORMANCE BOND**

Bond No. \_\_\_\_\_

For

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

KNOW ALL WHO SHALL SEE THESE PRESENTS:

That \_\_\_\_\_  
of \_\_\_\_\_ as Principal,  
and \_\_\_\_\_  
of \_\_\_\_\_ as Surety,  
firmly bound and held unto the State of Alaska in the penal sum of \_\_\_\_\_ Dollars

( \$ \_\_\_\_\_ ) good and lawful money of the United States of America for the payment whereof, well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the \_\_\_\_\_ of \_\_\_\_\_ A.D., 20\_\_\_\_, for construction of the above-named project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall well and truly perform and complete all obligations and work under said contract and if the Principal shall reimburse upon demand of the Alaska Energy Authority any sums paid him which exceed the final payment determined to be due upon completion of the project, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at \_\_\_\_\_, this \_\_\_\_\_ day of \_\_\_\_\_ A.D., 20\_\_\_\_.

**Principal:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**By:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Phone:** (    ) \_\_\_\_\_

**Surety:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**By:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Phone:** (    ) \_\_\_\_\_

The offered bond has been checked for adequacy under the applicable statutes and regulations:

\_\_\_\_\_  
Alaska Energy Authority Authorized Representative

\_\_\_\_\_  
Date

See Instructions on Reverse

## INSTRUCTIONS

1. This form shall be used whenever a performance bond is required. There shall be no deviation from this form without approval from the Contracting Officer.
2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.
3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.
4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.
5. The bond shall be signed by authorized persons. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.

ALASKA ENERGY AUTHORITY

**PAYMENT BOND**

Bond No. \_\_\_\_\_

For

**Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects  
Project No. 22021**

NOW ALL WHO SHALL SEE THESE PRESENTS:

That \_\_\_\_\_  
of \_\_\_\_\_ as Principal,  
and \_\_\_\_\_  
of \_\_\_\_\_ as Surety,  
firmly bound and held unto the State of Alaska in the penal sum of \_\_\_\_\_ Dollars

(\$ \_\_\_\_\_) good and lawful money of the United States of America for the payment whereof, well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the \_\_\_\_\_ of \_\_\_\_\_ A.D., 20\_\_\_\_, for construction of the above-referenced project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall comply with all requirements of law and pay, as they become due, all just claims for labor performed and materials and supplies furnished upon or for the work under said contract, whether said labor be performed and said materials and supplies be furnished under the original contract, any subcontract, or any and all duly authorized modifications thereto, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at \_\_\_\_\_, \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ A.D., 20\_\_\_\_.

**Principal:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**By:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Phone:** ( ) \_\_\_\_\_

**Surety:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**By:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_

**Phone:** ( ) \_\_\_\_\_

The offered bond has been checked for adequacy under the applicable statutes and regulations:

\_\_\_\_\_  
**Alaska Energy Authority Authorized Representative**

\_\_\_\_\_  
**Date**

See Instructions on Reverse

## **INSTRUCTIONS**

1. This form, for the protection of persons supplying labor and material, shall be used whenever a payment bond is required. There shall be no deviation from this form without approval from the Contracting Officer.
2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.
3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.
4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.
5. The bond shall be signed by authorized persons. Where such persons are signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.



2. What percent of the total value of this contract do you intend to subcontract? \_\_\_\_\_ %

3. Do you propose to purchase any equipment for use on this project?  
[ ] No [ ] Yes If YES, describe type, quantity, and approximate cost:

---

---

---

4. Do you propose to rent any equipment for this work?  
[ ] No [ ] Yes If YES, describe type and quantity:

---

---

---

5. Is your bid based on firm offers for all materials necessary for this project?  
[ ] Yes [ ] No If NO, please explain:

---

---

---

**C. EXPERIENCE**

1. Have you had previous construction contracts or subcontracts with the Authority?  
[ ] Yes [ ] No

Describe the most recent or current contract, its completion date, and scope of work:

---

---

---

---

2. List, as an attachment to this questionnaire, other construction projects you have completed, the dates of completion, scope of work, and total contract amount for each project completed in the past 12 months.

**I hereby certify that the above statements are true and complete.**

\_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
Name and Title of Person Signing

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**ALASKA ENERGY AUTHORITY**  
**SECTION 00 70 00**  
**GENERAL CONDITIONS**

- ARTICLE 1     DEFINITIONS
- ARTICLE 2     AUTHORIZATION AND LIMITATIONS
- 2.1     Authorities and Limitations
- 2.2     Evaluations by Contracting Officer
- 2.3     Means and Methods
- 2.4     Visits to Site
- ARTICLE 3     CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE
- 3.1     Incomplete Contract Documents
- 3.2     Copies of Contract Documents
- 3.3     Scope of Work
- 3.4     Intent of Contract Documents
- 3.5     Discrepancy in Contract Documents
- 3.6     Clarifications and Interpretations
- 3.7     Reuse of Documents
- ARTICLE 4     LANDS AND PHYSICAL CONDITIONS
- 4.1     Availability of Lands
- 4.2     Visit to Site
- 4.3     Explorations and Reports
- 4.4     Utilities
- 4.5     Damaged Utilities
- 4.6     Utilities Not Shown or Indicated
- 4.7     Survey Control
- ARTICLE 5     BONDS AND INSURANCE, AND INDEMNIFICATION
- 5.1     Delivery of Bonds
- 5.2     Bonds
- 5.3     Replacement of Bond and Surety
- 5.4     Insurance Requirements
- 5.5     Indemnification
- ARTICLE 6     CONTRACTOR'S RESPONSIBILITIES
- 6.1     Supervision of Work
- 6.2     Superintendence by CONTRACTOR
- 6.3     Character of Workers
- 6.4     CONTRACTOR to Furnish
- 6.5     Materials and Equipment
- 6.6     Anticipated Schedules
- 6.7     Finalizing Schedules
- 6.8     Adjusting Schedules
- 6.9     Substitutes or "Or-Equal" Items
- 6.10    Substitute Means and Methods
- 6.11    Evaluation of Substitution
- 6.12    Dividing the Work
- 6.13    Subcontractors

- 6.14 Use of Premises
- 6.15 Structural Loading
- 6.16 Record Documents
- 6.17 Safety and Protection
- 6.18 Safety Representative
- 6.19 Emergencies
- 6.20 Shop Drawings and Samples
- 6.21 Shop Drawing and Sample Review
- 6.22 Maintenance during Construction
- 6.23 Continuing the Work
- 6.24 Consent to Assignment
- 6.25 Use of Explosives
- 6.26 CONTRACTOR's Records
- 6.27 Load Restrictions

ARTICLE 7 LAWS AND REGULATIONS

- 7.1 Laws to be observed
- 7.2 Permits, Licenses, and Taxes
- 7.3 Patented Devices, Materials and Processes
- 7.4 Compliance of Specifications and Drawings
- 7.5 Accident Prevention
- 7.6 Sanitary Provisions
- 7.7 Business Registration
- 7.8 Professional Registration and Certification
- 7.9 Local Building Codes
- 7.10 Air Quality Control
- 7.11 Archaeological or Paleontological Discoveries
- 7.12 Applicable Alaska Preferences
- 7.13 Preferential Employment
- 7.14 Wages and Hours of Labor
- 7.15 Overtime Work Hours and Compensation
- 7.16 Covenants against Contingent Fees
- 7.17 Officials Not to Benefit
- 7.18 Personal Liability of Public Officials

ARTICLE 8 OTHER WORK

- 8.1 Related Work at Site
- 8.2 Access, Cutting, and Patching
- 8.3 Defective Work by Others
- 8.4 Coordination

ARTICLE 9 CHANGES

- 9.1 AUTHORITY's Right to Change
- 9.2 Authorization of Changes within the General Scope
- 9.3 Directive
- 9.4 Change Order
- 9.5 Shop Drawing Variations
- 9.6 Changes outside the General Scope; Supplemental Agreement
- 9.7 Unauthorized Work
- 9.8 Notification of Surety
- 9.9 Differing Site Conditions

9.10 Interim Work Authorization

ARTICLE 10 CONTRACT PRICE; COMPUTATION AND CHANGE

- 10.1 Contract Price
- 10.2 Claims for Price Change
- 10.3 Change Order Price Determination
- 10.4 Cost of the Work
- 10.5 Excluded Costs
- 10.6 CONTRACTOR's Fee
- 10.7 Cost Breakdown
- 10.8 Cash Allowances
- 10.9 Unit Price Work
- 10.10 Determinations for Unit Prices

ARTICLE 11 CONTRACT TIME, COMPUTATION AND CHANGE

- 11.1 Commencement of Contract Time; Notice to Proceed
- 11.2 Starting the Work
- 11.3 Computation of Contract Time
- 11.4 Time Change
- 11.5 Extension Due to Delays
- 11.6 Essence of Contract
- 11.7 Reasonable Completion Time
- 11.8 Delay Damages

ARTICLE 12 QUALITY ASSURANCE

- 12.1 Warranty and Guaranty
- 12.2 Access to Work
- 12.3 Tests and Inspections
- 12.4 Uncovering Work
- 12.5 AUTHORITY May Stop the Work
- 12.6 Correction or Removal of Defective Work
- 12.7 One Year Correction Period
- 12.8 Acceptance of Defective Work
- 12.9 AUTHORITY may Correct Defective Work

ARTICLE 13 PAYMENTS TO CONTRACTOR AND COMPLETION

- 13.1 Schedule of Values
- 13.2 Preliminary Payments
- 13.3 Application for Progress Payment
- 13.4 Review of Applications for Progress Payments
- 13.5 Stored Materials and Equipment
- 13.6 CONTRACTOR's Warranty of Title
- 13.7 Withholding of Payments
- 13.8 Retainage
- 13.9 Request for Release of funds
- 13.10 Substantial Completion
- 13.11 Access Following Substantial Completion
- 13.12 Final Inspection
- 13.13 Final Completion and Application for Payment
- 13.14 Final Payment

- 13.15 Final Acceptance
- 13.16 CONTRACTOR's Continuing Obligation
- 13.17 Waiver of Claims by CONTRACTOR
- 13.18 No Waiver of Legal Rights

ARTICLE 14 SUSPENSION OF WORK AND TERMINATION

- 14.1 AUTHORITY May Suspend Work
- 14.2 Default of Contract
- 14.3 Rights or Remedies
- 14.4 Convenience Termination

ARTICLE 15 CLAIMS AND DISPUTES

- 15.1 Notification
- 15.2 Presenting Claim
- 15.3 Claim Validity, Additional Information & Authority's Action
- 15.4 Contracting Officer's Decision
- 15.5 Appeals on a Contract Claim
- 15.6 Construction Contract Claim Appeal
- 15.7 Fraud and Misrepresentation in Making a Claim

## **ARTICLE 1 - DEFINITIONS**

Wherever used in the Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning, unless a different intent or meaning is clearly indicated, shall be interpreted as set forth below.

The titles and headings of the articles, sections, and subsections herein are intended for convenience of reference.

Terms not defined below shall have their ordinary accepted meanings within the context which they are used. Words which have a well-known technical or trade meaning when used to describe work, materials or equipment shall be interpreted in accordance with such meaning. Words defined in Article 1 are to be interpreted as defined.

**Addenda** - All clarifications, corrections, or changes issued graphically or in writing by the AUTHORITY after the Advertisement but prior to the opening of Proposals.

**Advertisement** - The public announcement, as required by law, inviting bids for Work to be performed or materials to be furnished.

**Application for Payment** - The form provided by the AUTHORITY which is to be used by the CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

**Approved or Approval** - Means written approval by the Contracting Officer or his authorized representative as defined in Article 2.1. 'Approved' or 'Approval' as used in this contract document shall mean that the Authority has received a document, form or submittal from the Contractor and that the Authority has taken "No exceptions" to the item submitted. Unless the context clearly indicates otherwise, approved or approval shall not mean that the Authority approves of the methods or means, or that the item or form submitted meets the requirements of the contract or constitutes acceptance of the Contractor's work. Where approved or approval means acceptance, then such approval must be set forth in writing and signed by the contracting officer or his designee.

**A.S** - Initials which stand for Alaska Statute.

**Authority** - The Alaska Energy Authority (AEA). References to "Contracting Agency" means the AUTHORITY. The AUTHORITY is acting as an agent for Owner.

**Award** - The acceptance, by the AUTHORITY, of the successful bid.

**Bid Bond** - A type of Proposal Guaranty.

**Bidder** - Any individual, firm, corporation or any acceptable combination thereof, or joint venture submitting a bid for the advertised Work.

**Calendar Day** - Every day shown on the calendar, beginning and ending at midnight.

**Change Order** - A written order by the AUTHORITY directing changes to the Contract Documents, within their general scope.

**Consultant** - The person, firm, or corporation retained directly by the AUTHORITY to prepare Contract Documents, perform construction administration services, or other Project related services. References to Authority's Consultants shall include Engineer.

**Contingent Sum Work Item** - When the bid schedule contains a Contingent Sum Work Item, the Work covered shall be performed only upon the written Directive of the Project Manager. Payment shall be made as provided in the Directive.

**Contract** - The written agreement between the AUTHORITY and the CONTRACTOR setting forth the obligations of the parties and covering the Work to be performed, all as required by the Contract Documents.

**Contract Documents** - The Contract form, Addenda, the bidding requirements and CONTRACTOR's bid (including all appropriate bid tender forms), the bonds, the Conditions of the Contract and all other Contract requirements, the Specifications, and the Drawings furnished by the AUTHORITY to the CONTRACTOR, together with all Change Orders and documents approved by the Contracting Officer, for inclusion, modifications and supplements issued on or after the Effective Date of the Contract.

**Contracting Officer** - The person authorized by the Executive Director to enter into and administer the Contract on behalf of the AUTHORITY; who has authority to make findings, determinations and decisions with respect to the Contract and, when necessary, to modify or terminate the Contract. The Contracting Officer is identified on the construction Contract.

**Contractor** - The individual, firm, corporation or any acceptable combination thereof, contracts with the AUTHORITY for performance of the Work.

**Contract Price** - The total moneys payable by the AUTHORITY to the CONTRACTOR under the terms of the Contract Documents.

**CONTRACTOR's Release** – CONTRACTOR's written notification to the AUTHORITY specifying final payment due and releasing the AUTHORITY of any and all claims.

**Contract Time** - The number of Calendar Days following issuance of Notice-to-Proceed in which the project shall be rendered Substantially Complete, or if specified as a calendar date, the Substantial Completion date specified in the Contract Documents.

**Controlling Item** - Any feature of the Work on the critical path of a network schedule.

**Defective** - Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents.

**Directive** - A written communication to the CONTRACTOR from the Contracting Officer interpreting or enforcing a Contract requirement or ordering commencement of an item of Work.

**Drawings** - The Drawings which show the character and scope of the Work to be performed and which have been furnished by the AUTHORITY and are by reference made a part of the Contract Documents.

**Engineer** - The person, firm, or corporation retained directly by the AUTHORITY to prepare Contract Documents, perform construction administration services, or other Project related services.

**Equipment** - All machinery together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.

**Final Completion** - The Project has progressed to the point that all required Work is complete..

**Furnish** - To procure, transport, and deliver to the project site materials, labor, or equipment, for installation or use on the project.

**General Requirements** - Sections of Division 1 of the Specifications which contain administrative and procedural requirements as well as requirements for temporary facilities which apply to Specification Divisions 2 through 16.

**Holidays** - In the State of Alaska, Legal Holidays occur on:

1. New Years Day - January 1
2. Martin Luther King's Birthday - Third Monday in January
3. President's Day - Third Monday in February
4. Seward's Day - Last Monday in March
5. Memorial Day - Last Monday in May
6. Independence Day - July 4
7. Labor Day - First Monday in September
8. Alaska Day - October 18
9. Veteran's Day - November 11
10. Thanksgiving Day - Fourth Thursday in November
11. Christmas Day - December 25
12. Every Sunday
13. Every day designated by public proclamation by the President of the United States or the Governor of the State as a legal Holiday.

If any Holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal Holidays. If the Holiday should fall on a Sunday, except (12) above, Sunday and the following Monday are both legal Holidays. See Title 44, Alaska Statutes.

**Install** - Means to build into the Work, ready to be used in complete and operable condition and in compliance with Contract Documents.

**Interim Work Authorization** - A written order by the Project Manager initiating changes to the Contract within its general scope, until a subsequent Change Order is executed.

**Invitation for Bids** - A portion of the bidding documents soliciting bids for the Work to be performed.

**Materials** - Any substances specified for use in the construction of the project.

**Notice of Intent to Award** - The written notice by the AUTHORITY to all Bidders identifying the apparent successful Bidder and establishing the AUTHORITY's intent to execute the Contract when all conditions required for execution of the Contract are met.

**Notice to Proceed** - A written notice to the CONTRACTOR to begin the Work and establishing the date on which the Contract Time begins.

**Onsite Project Representative** - The Engineer's authorized representative assigned to make detailed observations relating to contract performance.

**Owner** – Means Grantee for whom the ALASKA ENERGY AUTHORITY is acting as an agent of.

**Payment Bond** - The security furnished by the CONTRACTOR and his Surety to guarantee payment of the debts covered by the bond.

**Performance Bond** - The security furnished by the CONTRACTOR and his Surety to guarantee performance and completion of the Work in accordance with the Contract.

**Pre-construction Conference** - A meeting between the CONTRACTOR, Project Manager and the Engineer, and other parties affected by the construction, to discuss the project before the CONTRACTOR begins work.

**Project Manager** - The authorized representative of the Contracting Officer who is responsible for administration of the Contract.

**Procurement Manager/Officer** - The person authorized by the Contracting Officer to administer the Contract on behalf of the AUTHORITY; who has authority to make findings, determinations and decisions with respect to the Contract and, when necessary present such to the Contracting Officer, to modify or terminate the Contract.

**Project** - The total construction, of which the Work performed under the Contract Documents, is the whole or a part, where such total construction may be performed by more than one CONTRACTOR.

**Proposal** - The offer of a Bidder, on the prescribed forms, to perform the Work at the prices quoted.

**Proposal Guaranty** - The security furnished with a Proposal to guarantee that the bidder will enter into a Contract if his Proposal is accepted by the AUTHORITY.

**Quality Assurance (QA)** - Where referred to in the technical specifications (Divisions 2 through 16), Quality Assurance refers to measures to be provided by the CONTRACTOR as specified.

**Quality Control (QC)** - Tests and inspections by the CONTRACTOR to insure the acceptability of materials incorporated into the work. QC test reports are used as a basis upon which to determine whether the Work conforms to the requirements of the Contract Documents and to determine its acceptability for payment.

**Regulatory Requirements** - Laws, rules, regulations, ordinances, codes and/or orders.

**Schedule of Values** - Document submitted by the CONTRACTOR and reviewed by the Contracting Officer, which shall serve as the basis for computing payment and for establishing the value of separate items of Work which comprise the Contract Price.

**Shop Drawings** - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the CONTRACTOR to illustrate material, equipment, fabrication, or erection for some portion of the Work. Where used in the Contract Documents, "Shop Drawings" shall also mean "Submittals".

**Specifications** - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

**Subcontractor** - An individual, firm, or corporation to whom the CONTRACTOR or any other Subcontractor sublets part of the Contract.

**Substantial Completion** - Although not fully completed, the Work (or a specified part thereof) has progressed to the point where it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

**Supplemental Agreement** - A written agreement between the CONTRACTOR and the AUTHORITY covering work that is not within the general scope of the Contract.

**Supplementary Conditions** - The part of the Contract Documents which amends or supplements these General Conditions.

**Supplier** - A manufacturer, fabricator, distributor, material man, or vendor of materials or equipment.

**Surety** - The corporation, partnership, or individual, other than the CONTRACTOR, executing a bond furnished by the CONTRACTOR.

**Unit Price Work** - Work to be paid for on the basis of unit prices.

**Utility** - The privately, publicly or cooperatively owned lines, facilities and systems for producing, transmitting or distributing communications, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway or street drainage, and other similar commodities, including publicly owned fire and police signal systems, street lighting systems, and railroads which directly or indirectly serve the public or any part thereof. The term "utility" shall also mean the utility company, inclusive of any wholly owned or controlled subsidiary."

**Work** - Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as required by the Contract Documents. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

## **ARTICLE 2 – AUTHORIZATION AND LIMITATIONS**

### **2.1 Authorities and Limitations**

- 2.1.1 The Contracting Officer alone shall have the power to bind the AUTHORITY and to exercise the rights, responsibilities, authorities and functions vested in the Contracting Officer by the Contract Documents. The Contracting Officer shall have the right to designate in writing authorized representatives to act for him. Wherever any provision of the Contract Documents specifies an individual or organization, whether governmental or private, to perform any act on behalf of or in the interest of the AUTHORITY that individual or organization shall be deemed to be the Contracting Officer's authorized representative under this Contract but only to the extent so specified.
- 2.1.2 The CONTRACTOR shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative's authority to act for the Contracting Officer. The CONTRACTOR assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.
- 2.1.3 The performance or nonperformance of the Contracting Officer or his authorized representative, shall not give rise to any contractual obligation or duty to the CONTRACTOR, any Subcontractor, any Supplier, or any other organization performing any of the Work or any Surety representing them.

### **2.2 Evaluations by Contracting Officer:**

- 2.2.1 The Contracting Officer or his authorized representative will decide all questions which may arise as to:
- a. Quality and acceptability of materials furnished;
  - b. Quality and acceptability of Work performed;
  - c. Compliance with the schedule of progress;
  - d. Interpretation of Contract Documents;
  - e. Acceptable fulfillment of the Contract on the part of the CONTRACTOR.
- 2.2.2 In order to avoid cumbersome terms and confusing repetition of expressions in the Contract Documents the terms "as ordered", "as directed", "as required", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used it shall be understood as if the expression were followed by the words "the Contracting Officer".

When such terms are used to describe a requirement, direction, review or judgment of the Contracting Officer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise).

- 2.2.3 The use of any such term or adjective shall not be effective to assign to the AUTHORITY any duty of authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

**2.3 Means & Methods:**

The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Contract Documents are the sole responsibility of the CONTRACTOR.

**2.4 Visits to Site/Place of Business:**

The Contracting Officer will make visits to the site and approved remote storage sites at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. The Contracting Officer may, at reasonable times, inspect that part of the plant or place of business of the CONTRACTOR or Subcontractor that is related to the performance of the Contract. Such observations or the lack of such observations shall in no way relieve the CONTRACTOR from his duty to perform the Work in accordance with the Contract Documents.

**ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

**3.1 Incomplete Contract Documents:**

The submission of a bid by the Bidder is considered a representation that the Bidder examined the Contract Documents to make certain that all sheets and pages were provided and that the Bidder is satisfied as to the conditions to be encountered in performing the Work. The AUTHORITY expressly denies any responsibility or liability for a bid submitted on the basis of an incomplete set of Contract Documents.

**3.2 Copies of Contract Documents:**

The AUTHORITY shall furnish to the CONTRACTOR up to six copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

**3.3 Scope of Work:**

The Contract Documents comprise the entire Contract between the AUTHORITY and the CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the Regulatory Requirements of the place of the Project.

It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of the Contract to create in the public or any member thereof a third party benefit, or to authorize anyone not a party to this Contract to maintain a suit pursuant to the terms or provisions of the Contract.

**3.4 Intent of Contract Documents:**

- 3.4.1 It is the intent of the Contract Documents to describe a functionally complete Project to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the

intended result will be supplied, without any adjustment in Contract Price or Contract Time, whether or not specifically called for.

- 3.4.2 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Regulatory Requirements of any governmental authority, whether such reference be specific or by implication, shall mean the edition stated in the Contract Documents or if not stated the latest standard specification, manual, code or Regulatory Requirements in effect at the time of Advertisement for the Project (or, on the Effective Date of the Contract if there was no Advertisement). However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the AUTHORITY and the CONTRACTOR, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the AUTHORITY or any of the AUTHORITY's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3.

### **3.5 Discrepancy in Contract Documents:**

- 3.5.1 Before undertaking the Work, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures, and dimensions shown thereon and all applicable field measurements. Work in the area by the CONTRACTOR shall imply verification of figures, dimensions and field measurements. If, during the above study or during the performance of the Work, the CONTRACTOR finds a conflict, error, discrepancy or omission in the Contract Documents, or a discrepancy between the Contract Documents and any standard specification, manual, code, or Regulatory Requirement which affects the Work, the CONTRACTOR shall promptly report such discrepancy in writing to the Contracting Officer. The CONTRACTOR shall obtain a written interpretation or clarification from the Contracting Officer before proceeding with any Work affected thereby. Any adjustment made by the CONTRACTOR without this determination shall be at his own risk and expense. However, the CONTRACTOR shall not be liable to the AUTHORITY for failure to report any conflict, error or discrepancy in the Contract Documents unless the CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

#### 3.5.2 Discrepancy - Order of Precedence:

When conflicts errors or discrepancies within the Contract Documents exist, the order of precedence from most governing to least governing will be as follows:

- Contents of Addenda
- Supplementary Conditions
- General Conditions
- General Requirements
- Technical Specifications
- Drawings
- Recorded dimensions will govern over scaled dimensions
- Large scale details over small scale details
- Schedules over plans
- Architectural drawings over structural drawings Structural drawings over mechanical and electrical drawings

### **3.6 Clarifications and Interpretations:**

The Contracting Officer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as the Contracting Officer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

### **3.7 Reuse of Documents:**

Neither the CONTRACTOR nor any Subcontractor, or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the AUTHORITY shall have or acquire any title to or ownership rights in any of the Contract Documents (or copies thereof) prepared by or for the AUTHORITY and they shall not reuse any of the Contract Documents on extensions of the Project or any other project without written consent of the Contracting Officer.

Contract Documents prepared by the CONTRACTOR in connection with the Work shall become the property of the AUTHORITY.

## **ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS**

### **4.1 Availability of Lands:**

The AUTHORITY shall furnish as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for use of the CONTRACTOR in connection with the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the AUTHORITY, unless otherwise provided in the Contract Documents. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment. The CONTRACTOR shall provide all waste and disposal areas, including disposal areas for hazardous or contaminated materials, at no additional cost to the AUTHORITY.

### **4.2 Visit to Site:**

The submission of a bid by the CONTRACTOR is considered a representation that the CONTRACTOR has visited and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents.

### **4.3 Explorations and Reports:**

Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by the AUTHORITY in preparation of the Contract Documents. The CONTRACTOR may for his purposes rely upon the accuracy of the factual data contained in such reports, but not upon interpretations or opinions drawn from such factual data contained therein or for the completeness or sufficiency thereof. Except as indicated in the immediately preceding sentence and in paragraphs 4.4 and 9.9, CONTRACTOR shall have full responsibility with respect to surface and subsurface conditions at the site.

#### **4.4 Utilities:**

- 4.4.1 The horizontal and vertical locations of known underground utilities as shown or indicated by the Contract Documents are approximate and are based on information and data furnished to the AUTHORITY by the owners of such underground utilities.
- 4.4.2 The CONTRACTOR shall have full responsibility for:
- a. Reviewing and checking all information and data concerning utilities.
  - b. Locating all underground utilities shown or indicated in the Contract Documents which are affected by the Work.
  - c. Coordination of the Work with the owners of all utilities during construction.
  - d. Safety and protection of all utilities as provided in paragraph 6.17.
  - e. Repair of any damage to utilities resulting from the Work in accordance with 4.4.4 and 4.5.
- 4.4.3 If Work is to be performed by any utility owner, the CONTRACTOR shall cooperate with such owners to facilitate the Work.
- 4.4.4 In the event of interruption to any utility service as a result of accidental breakage or as result of being exposed or unsupported, the CONTRACTOR shall promptly notify the utility owner and the Project Manager. If service is interrupted, repair work shall be continuous until the service is restored. No Work shall be undertaken around fire hydrants until provisions for continued service has been approved by the local fire authority.

#### **4.5 Damaged Utilities:**

When utilities are damaged by the CONTRACTOR, the utility owner shall have the choice of repairing the utility or having the CONTRACTOR repair the utility. In the following circumstances, the CONTRACTOR shall reimburse the utility owner for repair costs or provide at no cost to the utility owner or the AUTHORITY, all materials, equipment and labor necessary to complete repair of the damage:

- a. When the utility is shown or indicated in the Contract Documents.
- b. When the utility has been located by the utility owner.
- c. When no locate was requested by the CONTRACTOR for utilities shown or indicated in the Contract Documents.
- d. All visible utilities.
- e. When the CONTRACTOR could have, otherwise, reasonably been expected to be aware of such utility.

#### **4.6 Utilities Not Shown or Indicated:**

If, while directly performing the Work, an underground utility is uncovered or revealed at the site which was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall, promptly after

becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.19) identify the owner of such underground utility and give written notice thereof to that owner and to the Project Manager. The Project Manager will promptly review the underground utility to determine the extent to which the Contract Documents and the Work should be modified to reflect the impacts of the discovered utility. The Contract Documents will be amended or supplemented in accordance with paragraph 9.2 and to the extent necessary through the issuance of a change document by the Contracting Officer. During such time, the CONTRACTOR shall be responsible for the safety and protection of such underground utility as provided in paragraph 6.17. The CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are directly attributable to the existence of any underground utility that was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of.

#### **4.7 Survey Control:**

The AUTHORITY will identify sufficient horizontal and vertical control data to enable the CONTRACTOR to survey and layout the Work. All survey work shall be performed under the direct supervision of a registered land surveyor when required by paragraph 7.8. Copies of all survey notes shall be provided to the AUTHORITY at an interval determined by the Project Manager. The Project Manager may request submission on a weekly or longer period at his discretion. Any variations between the Contract Documents and actual field conditions shall be identified in the survey notes. Survey notes are to be in a format acceptable to the AUTHORITY.

### **ARTICLE 5 - BONDS, INSURANCE, AND INDEMNIFICATION**

#### **5.1 Delivery of Bonds:**

When the CONTRACTOR delivers the executed Contract to the Contracting Officer, the CONTRACTOR shall also deliver to the Contracting Officer such bonds as the CONTRACTOR may be required to furnish in accordance with paragraph 5.2.

#### **5.2 Bonds:**

5.2.1 The CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount as shown on the Contract as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect for one year after the date of Final Acceptance and until all obligations under this Contract, except special guarantees as per 12.7, have been met. All bonds shall be furnished on forms provided by the AUTHORITY (or copies thereof) and shall be executed by such Sureties as are authorized to do business in the State of Alaska. The Contracting Officer may at his option copy the Surety with notice of any potential default or liability.

#### **5.3 Replacement of Bond and Surety:**

If the Surety on any bond furnished in connection with this Contract is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.2, or otherwise becomes unacceptable to the AUTHORITY, or if any such Surety fails to furnish reports as to his financial condition as requested by the AUTHORITY, the CONTRACTOR shall within five days thereafter substitute another bond and Surety, both of which must be acceptable to AUTHORITY.

An individual Surety may be replaced by a corporate Surety during the course of the Contract period. If the Surety desires to dispose of the collateral posted, the AUTHORITY may, at its option, accept substitute collateral.

#### **5.4 Insurance Requirements:**

5.4.1 The CONTRACTOR shall provide evidence of insurance with a carrier or carriers satisfactory to the AUTHORITY covering injury to persons and/or property suffered by the Alaska Energy Authority or a third party, as a result of operations which arise both out of and during the course of this Contract by the CONTRACTOR or by any Subcontractor. This coverage will also provide protection against injuries to all employees of the CONTRACTOR and the employees of any Subcontractor engaged in Work under this Contract.

5.4.2 The CONTRACTOR shall maintain in force at all times during the performance of Work under this agreement the following policies and minimum limits of liability. Where specific limits and coverages are shown, it is understood that they shall be the minimum acceptable. The requirements of this paragraph shall not limit the CONTRACTOR's responsibility to indemnify under paragraph 5.5. Additional insurance requirements specific to this Contract are contained in the Supplementary Conditions, when applicable.

a. Workers' Compensation Insurance: The Contractor shall provide and maintain, for all employees of the Contractor engaged in work under this contract, Workers' Compensation Insurance as required by AS 23.30.045. The Contractor shall be responsible for Workers' Compensation Insurance for any subcontractor who provides services under this contract, to include:

1. Waiver of subrogation against the Authority and Employer's Liability Protection in the amount of \$500,000 each accident/\$500,000 each disease.
2. If the Contractor directly utilizes labor outside of the State of Alaska in the prosecution of the work, "Other States" endorsement shall be required as a condition of the contract.
3. Whenever the work involves activity on or about navigable waters, the Workers' Compensation policy shall contain a United States Longshoreman's and Harbor Worker's Act endorsement, and when appropriate, a Maritime Employer's Liability (Jones Act) endorsement with a minimum limit of \$1,000,000.

b. Commercial General Liability Insurance: on an occurrence policy form covering all operations by or on behalf of the CONTRACTOR with combined single limits not less than:

1. If the CONTRACTOR carries a *Comprehensive General Liability* policy, the limits of liability shall not be less than a Combined Single Limit for bodily injury, property damage and Personal Injury Liability of:  
\$1,000,000 each occurrence  
\$2,000,000 aggregate
2. If the CONTRACTOR carries a *Commercial General Liability* policy, the limits of liability shall not be less than:  
\$1,000,000 each occurrence (Combined Single Limit for bodily injury and property damage)

\$1,000,000 for Personal Injury Liability

\$2,000,000 aggregate for Products-Completed Operations

\$2,000,000 general aggregate

The Authority and the Owner shall be named as "Additional Insured" under all liability coverages listed above.

- c. Automobile Liability Insurance: covering all vehicles used by the Contractor in the performance of services under this agreement with combined single limits not less than:

\$1,000,000 each occurrence

- d. Builder's Risk Insurance: Coverage shall be on an "All Risk" completed value basis including "quake and flood" and protect the interests of the AUTHORITY, the CONTRACTOR and Subcontractors at all tiers. Coverage shall include all materials, supplies and equipment that are intended for specific installation in the Project while such materials, supplies and equipment are located at the Project site, in transit from port of arrival to job site, or while temporarily located away from the Project site.

In addition to providing the above coverages the CONTRACTOR shall require that all indemnities obtained from any SUBCONTRACTORS be extended to include the Authority and Owner as an additional named indemnitees. CONTRACTOR shall further require that the Authority and the Owner be named as additional insured on all liability insurance policies maintained by all SUBCONTRACTORS under their contracts with CONTRACTOR, and that an appropriate waiver of subrogation in favor of the Authority be obtained with respect to all other insurance policies.

- e. Other Coverages: As specified in the Supplementary Conditions, if required.

- 5.4.3 a. In addition to providing the above coverages the Contractor shall, in any contract or agreement with subcontractors performing work, require that all indemnities and waivers of subrogation it obtains, and that any stipulation to be named as an additional insured it obtains, also be extended to waive rights of subrogation against the AUTHORITY and the Owner and to add the ALASKA ENERGY AUTHORITY and the Owner as additional named indemnitees and as additional insured.
- b. Evidence of insurance shall be furnished to the AUTHORITY prior to the award of the contract. Such evidence, executed by the carrier's representative and issued to the AUTHORITY, shall consist of a certificate of insurance or the policy declaration page with required endorsements attached thereto which denote the type, amount, class of operations covered, effective (and retroactive) dates, and dates of expiration. Acceptance by the AUTHORITY of deficient evidence does not constitute a waiver of contract requirements.
- c. When a certificate of insurance is furnished, it shall contain the following statement: "This is to certify that the policies described herein comply with all aspects of the insurance requirements of (Project Name and Number)."

## 5.5 Indemnification:

The CONTRACTOR shall indemnify, save harmless, and defend the AUTHORITY, the

OWNER its agents and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from the CONTRACTOR or SUBCONTRACTOR's performance of WORK under this Contract; however, this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the AUTHORITY's negligence.

## **ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES**

### **6.1 Supervision of Work:**

The CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. All Work under this Contract shall be performed in a skillful and workmanlike manner. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

### **6.2 Superintendence by CONTRACTOR:**

The CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent. The Project Manager shall be advised in writing of the superintendent's name, local address, and telephone number. This written advice is to be kept current until Final Acceptance by the AUTHORITY. The superintendent will be the CONTRACTOR's representative at the site and shall have full authority to act and sign documents on behalf of the CONTRACTOR.

All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall cooperate with the Project Manager in every way possible.

### **6.3 Character of Workers:**

The CONTRACTOR shall provide a sufficient number of competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The CONTRACTOR shall at all times maintain good discipline and order at the site. The Project Manager may, in writing, require the CONTRACTOR to remove from the Work any employee the Project Manager deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Project Manager shall have no duty to exercise this right.

### **6.4 CONTRACTOR to Furnish:**

Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance testing, start-up and completion of the Work.

### **6.5 Materials and Equipment:**

All materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by the Project Manager, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be

effective to assign to the AUTHORITY or any of the AUTHORITY's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 2.3.

## **6.6 Anticipated Schedules:**

- 6.6.1 Prior to submitting the CONTRACTOR's first Application for Payment the CONTRACTOR shall submit to the Project Manager for review an anticipated progress schedule indicating the starting and completion dates of the various stages of the Work.
- 6.6.2 Prior to submitting the CONTRACTOR's first Application for Payment, the CONTRACTOR shall submit to the Project Manager for review:

Anticipated schedule of Shop Drawing submissions; and

Anticipated Schedule of Values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by the CONTRACTOR at the time of submission.

## **6.7 Finalizing Schedules:**

Prior to processing the first Application for Payment the Project Manager and the CONTRACTOR will finalize schedules required by paragraph 6.6. The finalized progress schedule will be acceptable to the AUTHORITY as providing information related to the orderly progression of the Work to completion within the Contract Time; but such acceptance will neither impose on the AUTHORITY nor relieve the CONTRACTOR from full responsibility for the progress or scheduling of the Work. If accepted, the finalized schedule of Shop Drawing and other required submissions will be acknowledgment by the AUTHORITY as providing a workable arrangement for processing the submissions. If accepted, the finalized Schedule of Values will be acknowledgment by the AUTHORITY as an approximation of anticipated value of Work accomplished over the anticipated Contract Time. Receipt and acceptance of a schedule submitted by the CONTRACTOR shall not be construed to assign responsibility for performance or contingencies to the AUTHORITY or relieve the CONTRACTOR of his responsibility to adjust his forces, equipment, and work schedules as may be necessary to insure completion of the Work within prescribed Contract Time. Should the prosecution of the Work be discontinued for any reason, the CONTRACTOR shall notify the Project Manager at least 24 hours in advance of resuming operations.

## **6.8 Adjusting Schedules:**

Upon substantial changes to the schedule or upon request the CONTRACTOR shall submit to the Project Manager for acceptance (to the extent indicated in paragraph 6.7 and the General Requirements) adjustments in the schedules to reflect the actual present and anticipated progress of the Work.

## **6.9 Substitutes or "Or-Equal" Items:**

- 6.9.1 Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by

words indicating that substitution is limited or not permitted, materials or equipment of other Suppliers may be accepted by the Project Manager only if sufficient information is submitted by the CONTRACTOR which clearly demonstrates to the Project Manager that the material or equipment proposed is equivalent or equal in all aspects to that named. The procedure for review by the Project Manager will include the following as supplemented in the General Requirements.

- 6.9.2 Requests for review of substitute items of material and equipment will not be accepted by the Project Manager from anyone other than the CONTRACTOR.
- 6.9.3 If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the Project Manager for Approval thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as the specified. The application will state that the evaluation and Approval of the proposed substitute will not delay the CONTRACTOR's timely achievement of Substantial or Final Completion, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with the AUTHORITY for Work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
- 6.9.4 All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the AUTHORITY in evaluating the proposed substitute. The AUTHORITY may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed substitute. The Project Manager may reject any substitution request which the Project Manager determines is not in the best interest of the OWNER.
- 6.9.5 Substitutions shall be permitted during or after the bid period as allowed and in accordance with Document 00 02 00 - Invitation for Bids, Document 00 70 00 – General Conditions, and Document 01 60 00 – Materials and Equipment.

#### **6.10 Substitute Means and Methods:**

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, the CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the Project Manager, if the CONTRACTOR submits sufficient information to allow the Project Manager to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by the Project Manager will be similar to that provided in paragraph 6.9 as applied by the Project Manager and as may be supplemented in the General Requirements.

#### **6.11 Evaluation of Substitution:**

The Project Manager will be allowed a reasonable time within which to evaluate each proposed substitute. The Project Manager will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the Contracting Officer's prior written Approval which will be evidenced by either a Change Order or a Shop Drawing Approved in accordance with Sections 6.20 and 6.21. The Contracting Officer may require the CONTRACTOR to furnish at the

CONTRACTOR's expense a special performance guarantee or other Surety with respect to any substitute.

#### **6.12 Dividing the Work:**

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

#### **6.13 Subcontractors:**

The CONTRACTOR may utilize the services of appropriately licensed Subcontractors on those parts of the Work which, under normal contracting practices, are performed by Subcontractors, in accordance with the following conditions:

- 6.13.1 The CONTRACTOR shall not award any Work to any Subcontractor without prior written Approval of the Contracting Officer. This Approval will not be given until the CONTRACTOR submits to the Contracting Officer a written statement concerning the proposed award to the Subcontractor which shall contain required Equal Employment Opportunity documents, evidence of insurance whose limits are acceptable to the CONTRACTOR, and an executed copy of the subcontract. All subcontracts shall contain provisions for prompt payment, release of retainage, and interest on late payment amounts and retainage as specified in AS 36.90.210. Contracts between subcontractors, regardless of tier, must also contain these provisions.
- 6.13.2 The CONTRACTOR shall be fully responsible to the AUTHORITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions.
- 6.13.3 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the AUTHORITY and contains waiver provisions as required by paragraph 13.17 and termination provisions as required by Article 14.
- 6.13.4 Nothing in the Contract Documents shall create any contractual relationship between the AUTHORITY and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of the AUTHORITY to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Regulatory Requirements. The AUTHORITY will not undertake to settle any differences between or among the CONTRACTOR, Subcontractors, or Suppliers.
- 6.13.5 The CONTRACTOR and Subcontractors shall coordinate their work and cooperate with other trades so to facilitate general progress of Work. Each trade shall afford other trades every reasonable opportunity for installation of their work and storage of materials. If cooperative work of one trade must be altered due to lack of proper supervision or failure to make proper provisions in time by another trade, such conditions shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time.

6.13.6 The CONTRACTOR shall include on his own payrolls any person or persons working on this Contract who are not covered by written subcontract, and shall ensure that all Subcontractors include on their payrolls all persons performing Work under the direction of the Subcontractor.

**6.14 Use of Premises:**

The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project limits and approved remote storage sites and lands and areas identified in and permitted by Regulatory Requirements, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against the AUTHORITY by any such owner or occupant because of the performance of the Work, the CONTRACTOR shall hold the AUTHORITY harmless.

**6.15 Structural Loading:**

The CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

**6.16 Record Documents:**

The CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Directives, Change Orders, Supplemental Agreements, and written interpretations and clarifications (issued pursuant to paragraph 3.6) in good order and annotated to show all changes made during construction. These record documents together with all Approved samples and a counterpart of all Approved Shop Drawings will be available to the Project Manager for reference and copying. Upon completion of the Work, the annotated record documents, samples and Shop Drawings will be delivered to the Project Manager. Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the Contract Documents.

**6.17 Safety and Protection:**

The CONTRACTOR alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.17.1 All employees on the Work and other persons and organizations who may be affected thereby;

6.17.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.17.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable Regulatory Requirements of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The

CONTRACTOR shall notify owners of adjacent property and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time except as stated in 4.6, except damage or loss attributable to unforeseeable causes beyond the control of and without the fault or negligence of the CONTRACTOR, including but not restricted to acts of God, of the public enemy or governmental authorities. The CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until Final Acceptance (except as otherwise expressly provided in connection with Substantial Completion).

#### **6.18 Safety Representative:**

The CONTRACTOR shall designate a responsible safety representative at the site. This person shall be the CONTRACTOR's superintendent unless otherwise designated in writing by the CONTRACTOR to the Project Manager.

#### **6.19 Emergencies:**

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the AUTHORITY, is obligated to act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the Project Manager prompt written notice if the CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the AUTHORITY determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a change will be authorized by one of the methods indicated in Paragraph 9.2, as determined appropriate by the Project Manager.

#### **6.20 Shop Drawings and Samples:**

- 6.20.1 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the Project Manager for review and Approval in accordance with the accepted schedule of Shop Drawing submissions the required number of all Shop Drawings, which will bear a stamp or specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as the Project Manager may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Project Manager to review the information as required.
- 6.20.2 The CONTRACTOR shall also submit to the Project Manager for review and Approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.
- 6.20.3 Before submission of each Shop Drawing or sample the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation

requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

6.20.4 At the time of each submission the CONTRACTOR shall give the Project Manager specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Project Manager for review and Approval of each such variation. All variations of the proposed Shop Drawing from that specified will be identified in the submission and available maintenance, repair and replacement service will be indicated. The submittal will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such variation, including costs of redesign and claims of other Contractors affected by the resulting change, all of which shall be considered by the AUTHORITY in evaluating the proposed variation. If the variation may result in a change of Contract Time or Price, or Contract responsibility, and is not minor in nature; the CONTRACTOR must submit a written request for Change Order with the variation to notify the AUTHORITY of his intent. The AUTHORITY may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed variation. The Project Manager may reject any variation request which the Project Manager determines is not in the best interest of the AUTHORITY.

## **6.21 Shop Drawing and Sample Review:**

- 6.21.1 The Project Manager will review with reasonable promptness Shop Drawings and samples, but the Project Manager's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate acceptance of the assembly in which the item functions. The CONTRACTOR shall make corrections required by the Project Manager and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. The CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by the Project Manager on previous submittals.
- 6.21.2 The Project Manager's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless the CONTRACTOR has in writing advised the Project Manager of each such variation at the time of submission as required by paragraph 6.20.4. The Contracting Officer if he so determines, may give written Approval of each such variation by Change Order, except that, if the variation is minor and no Change Order has been requested a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample review comments shall suffice as a modification. Approval by the Contracting Officer will not relieve the CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.20.3.
- 6.21.3 The AUTHORITY shall be responsible for all AUTHORITY review costs resulting from the initial submission and the resubmittal. The CONTRACTOR shall, at the discretion of the AUTHORITY, pay all review costs incurred by the AUTHORITY as a result of any additional re-submittals.

6.21.4 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to the Project Manager's review and Approval of the pertinent submission will be the sole expense and responsibility of the CONTRACTOR.

**6.22 Maintenance During Construction:**

The CONTRACTOR shall maintain the Work during construction and until Substantial Completion, at which time the responsibility for maintenance shall be established in accordance with paragraph 13.10.

**6.23 Continuing the Work:**

The CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the AUTHORITY. No Work shall be delayed or postponed pending resolution of any disputes, disagreements, or claims except as the CONTRACTOR and the Contracting Officer may otherwise agree in writing.

**6.24 Consent to Assignment:**

The CONTRACTOR shall obtain the prior written consent of the Contracting Officer to any proposed assignment of any interest in, or part of this Contract. The consent to any assignment or transfer shall not operate to relieve the CONTRACTOR or his Sureties of any of his or its obligations under this Contract or the Performance Bonds. Nothing herein contained shall be construed to hinder, prevent, or affect an assignment of monies due, or to become due hereunder, made for the benefit of the CONTRACTOR's creditors pursuant to law.

**6.25 Use of Explosives:**

6.25.1 When the use of explosives is necessary for the prosecution of the Work, the CONTRACTOR shall exercise the utmost care not to endanger life or property, including new Work and shall follow all Regulatory Requirements applicable to the use of explosives. The CONTRACTOR shall be responsible for all damage resulting from the use of explosives.

6.25.2 All explosives shall be stored in a secure manner in compliance with all Regulatory Requirements, and all such storage places shall be clearly marked. Where no Regulatory Requirements apply, safe storage shall be provided not closer than 1,000 feet from any building, camping area, or place of human occupancy.

6.25.3 The CONTRACTOR shall notify each public utility owner having structures in proximity to the site of his intention to use explosives. Such notice shall be given sufficiently in advance to enable utility owners to take such steps as they may deem necessary to protect their property from injury. However, the CONTRACTOR shall be responsible for all damage resulting from the use of the explosives, whether or not, utility owners act to protect their property.

**6.26 CONTRACTOR's Records:**

6.26.1 Records of the CONTRACTOR and Subcontractors relating to personnel, payrolls, invoices of materials, and any and all other data relevant to the performance of this Contract, must be kept on a generally recognized accounting system. Such records must be available during normal work hours to the Contracting Officer for purposes of investigation to ascertain compliance with Regulatory Requirements and provisions of the Contract Documents.

- 6.26.2 Payroll records must contain the name and address of each employee, his correct classification, rate of pay, daily and weekly number of hours of work, deductions made, and actual wages paid. The CONTRACTOR and Subcontractors shall make employment records available for inspection by the Contracting Officer and representatives of the U.S. and/or State Department of Labor and will permit such representatives to interview employees during working hours on the Project.
- 6.26.3 Records of all communications between the AUTHORITY and the CONTRACTOR and other parties, where such communications affected performance of this Contract, must be kept by the CONTRACTOR and maintained for a period of three years from Final Acceptance. The AUTHORITY or its assigned representative may perform an audit of these records during normal work hours after written notice to the CONTRACTOR.

## **6.27 Load Restrictions**

The CONTRACTOR shall comply with all load restrictions as set forth in the "Administrative Permit Manual", and Title 17, Chapter 25, of the Alaska Administrative Code in the hauling of materials on public roads, beyond the limits of the project, and on all public roads within the project limits that are scheduled to remain in use upon completion of the project.

Overload permits may, at the discretion of the State, be issued for travel beyond the project limits for purposes of mobilization and/or demobilization. Issuance of such a permit will not relieve the CONTRACTOR of liability for damage which may result from the moving of equipment.

The operation of equipment of such weight or so loaded as to cause damage to any type of construction will not be permitted. No overloads will be permitted on the base course or surface course under construction. No loads will be permitted on a concrete pavement, base or structure before the expiration of the curing period. The CONTRACTOR shall be responsible for all damage done by his equipment.

## **ARTICLE 7 - LAWS AND REGULATIONS**

### **7.1 Laws to be Observed**

The CONTRACTOR shall keep fully informed of all federal and state Regulatory Requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work. The CONTRACTOR shall at all times observe and comply with all such Regulatory Requirements, orders and decrees; and shall protect and indemnify the AUTHORITY and its representatives against claim or liability arising from or based on the violation of any such Regulatory Requirement, order, or decree whether by the CONTRACTOR, Subcontractor, or any employee of either. Except where otherwise expressly required by applicable Regulatory Requirements, the AUTHORITY shall not be responsible for monitoring CONTRACTOR's compliance with any Regulatory Requirements.

### **7.2 Permits, Licenses, and Taxes**

- 7.2.1 The CONTRACTOR shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. As a condition of performance of this Contract, the CONTRACTOR shall pay all federal, state and local taxes incurred by the CONTRACTOR, in the performance of this Contract. Proof of

payment of these taxes is a condition precedent to final payment by the AUTHORITY under this Contract.

- 7.2.2 The CONTRACTOR's certification that taxes have been paid (as contained in the *Release of Contract*) will be verified with the Department of Revenue and Department of Labor, prior to final payment.
- 7.2.3 If any federal, state or local tax is imposed, charged, or repealed after the date of bid opening and is made applicable to and paid by the CONTRACTOR on the articles or supplies herein contracted for, then the Contract shall be increased or decreased accordingly by a Change Order.

### **7.3 Patented Devices, Materials and Processes**

If the CONTRACTOR employs any design, device, material, or process covered by letters of patent, trademark or copyright, the CONTRACTOR shall provide for such use by suitable legal agreement with the patentee or owner. The CONTRACTOR and the Surety shall indemnify and save harmless the AUTHORITY, any affected third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the AUTHORITY for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the Work.

### **7.4 Compliance of Specifications and Drawings:**

If the CONTRACTOR observes that the Specifications and Drawings supplied by the AUTHORITY are at variance with any Regulatory Requirements, CONTRACTOR shall give the Project Manager prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 9.2. as determined appropriate by the Project Manager. If the CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Regulatory Requirements, and without such notice to the Project Manager, the CONTRACTOR shall bear all costs arising there from; however, it shall not be the CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings supplied by the AUTHORITY are in accordance with such Regulatory Requirements.

### **7.5 Accident Prevention:**

The CONTRACTOR shall comply with AS 18.60.075 and all pertinent provisions of the Construction Code Occupational Safety and Health Standards issued by the Alaska Department of Labor.

### **7.6 Sanitary Provisions:**

The CONTRACTOR shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees and AUTHORITY representatives as may be necessary to comply with the requirements of the State and local Boards of Health, or of other bodies or tribunals having jurisdiction.

### **7.7 Business Registration:**

Comply with AS 08.18.011, as follows: "it is unlawful for a person to submit a bid or work as a contractor until he has been issued a certificate of registration by the Department of Commerce. A

partnership or joint venture shall be considered registered if one of the general partners or ventures whose name appears in the name under which the partnership or venture does business is registered."

#### **7.8 Professional Registration and Certification:**

All craft trades, architects, engineers and land surveyors, electrical administrators, and explosive handlers employed under the Contract shall specifically comply with applicable provisions of AS 08.18, 08.48, 08.40, and 08.52. Provide copies of individual licenses within seven days following a request from the Contracting Officer.

#### **7.9 Local Building Codes:**

The CONTRACTOR shall comply with AS 35.10.025 which requires construction in accordance with applicable local building codes to include the obtaining of required permits.

#### **7.10 Air Quality Control:**

The CONTRACTOR shall comply with all applicable provisions of AS 46.03.04 as pertains to Air Pollution Control.

#### **7.11 Archaeological or Paleontological Discoveries:**

When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, or paleontological remains, such as shell heaps, land or sea mammal bones or tusks, the CONTRACTOR shall cease operations immediately and notify the Project Manager. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the Contracting Officer order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra Work, such shall be covered by an appropriate Contract change document.

#### **7.12 Applicable Alaska Preferences:** Not Applicable.

#### **7.13 Preferential Employment:** Not Applicable.

#### **7.14 Wages and Hours of Labor:**

7.14.1 One certified copy of all payrolls shall be submitted weekly to the State Department of Labor and, upon request, to the Contracting Officer to assure to assure compliance with AS 36.05.040, *Filing Schedule of Employees Wages Paid and Other Information*. The CONTRACTOR shall be responsible for the submission of certified copies of payrolls of all Subcontractors. The certification shall affirm that the payrolls are current and complete, that the wage rates contained therein are not less than the applicable rates referenced in these Contract Documents, and that the classification set forth for each laborer or mechanic conforms to the Work performed. The CONTRACTOR and his Subcontractors shall attend all hearings and conferences and produce such books, papers, and documents all as requested by the Department of Labor. Should federal funds be involved, the appropriate federal agency shall also receive a copy of the CONTRACTOR's certified payrolls. Regardless of project funding source, copies of all certified payrolls supplied to the State Department of Labor by the CONTRACTOR shall be supplied also to the Project Manager upon request, including submittals made by, or on behalf of, subcontractors.

7.14.2 The following labor provisions shall also apply to this Contract:

- a. The CONTRACTOR and his Subcontractors shall pay all employees unconditionally and not less than once a week;
- b. wages may not be less than those stated under AS 36.05.010, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors;
- c. the scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of the Work;
- d. the AUTHORITY shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the CONTRACTOR or Subcontractors the difference between
  1. the rates of wages required by the Contract to be paid laborers, mechanics, or field surveyors on the Work, and
  2. the rates of wages in fact received by laborers, mechanics or field surveyors.

7.14.3 Within three calendar days of award of a construction contract, the CONTRACTOR shall file a "Notice of Work" with the Department of Labor and shall pay all related fees. The Contracting Officer will not issue Notice to Proceed to the CONTRACTOR until such notice and fees have been paid to the Department of Labor. Failure of the CONTRACTOR to file the Notice of Work and pay fees within this timeframe shall not constitute grounds for an extension of contract time or adjustment of contract price.

#### **7.15 Overtime Work Hours and Compensation:**

Pursuant to 40 *U.S.C.* 327-330 and AS 23.10.060 -.110, the CONTRACTOR shall not require nor permit any laborer or mechanic in any workweek in which he is employed on any Work under this Contract to work in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek on Work subject to the provisions of the *Contract Work Hours and Safety Standards Act* unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all such hours worked in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek whichever is the greater number of overtime hours. In the event of any violation of this provision, the CONTRACTOR shall be liable to any affected employee for any amounts due and penalties and to the AUTHORITY for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of this provision in the sum of \$10.00 for each Calendar Day on which such employee was required or permitted to be employed on such Work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by this paragraph.

#### **7.16 Covenant Against Contingent Fees:**

The CONTRACTOR warrants that no person or selling agent has been employed or retained to solicit or secure this Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the CONTRACTOR for the purpose of securing business. For breach or violation of this warrant, the AUTHORITY shall have the right to annul this Contract without liability or, in its discretion, to deduct price of consideration from the Contract or otherwise

recover the full amount of such commission, percentage, brokerage, or contingent fee.

**7.17 Officials Not to Benefit:**

No member of or delegate to the U.S. Congress, the Alaska State Legislature or other state official shall be admitted to any share or part of this Contract, nor to any benefit that may arise there from. However, this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.

**7.18 Personal Liability of Public Officials:**

In carrying out any of the provisions thereof, or in exercising any power or authority granted to the Contracting Officer by the Contract, there will be no liability upon the Contracting Officer nor upon AUTHORITY employees authorized as his representatives, either personally or as officials of the AUTHORITY, it being always understood that in such matters they act as agents and representatives of the AUTHORITY.

**ARTICLE 8 - OTHER WORK**

**8.1 Related Work at Site:**

8.1.1 The AUTHORITY reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Contract.

8.1.2 When separate contracts are let within the limits of the Project, the CONTRACTOR shall conduct his Work so as not to interfere with or hinder the work being performed by other contractors. The CONTRACTOR when working on the same Project with other contractors shall cooperate with such other contractors. The CONTRACTOR shall join his Work with that of the others in an acceptable manner and shall perform it in proper sequence to that of others.

8.1.3 If the fact that other such work is to be performed is identified or shown in the Contract Documents the CONTRACTOR shall assume all liability, financial or otherwise, in connection with this Contract and indemnify and save harmless the AUTHORITY from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the CONTRACTOR because of the presence and operations of other contractors.

8.1.4 If the fact that such other work is to be performed was not identified or shown in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work. If the CONTRACTOR believes that such performance will require an increase in Contract Price or Contract Time, the CONTRACTOR shall notify the Project Manager of such required increase within fifteen (15) calendar days following receipt of the Contracting Officer's notice. Should the Project Manager find such increase(s) to be justified, a Change Order will be executed.

**8.2 Access, Cutting, and Patching:**

The CONTRACTOR shall afford each utility owner and any other contractor who is a party to such a direct contract with the AUTHORITY (or the AUTHORITY, if the AUTHORITY is performing the additional work with the AUTHORITY's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with the work of others. The CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work, the CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering

their work and will only cut or alter such other work with the written consent of the Project Manager. The duties and responsibilities of the CONTRACTOR under this paragraph are for the benefit of other contractors to the extent that there are comparable provisions for the benefit of the CONTRACTOR in said direct contracts between the AUTHORITY and other contractors.

### **8.3 Defective Work by Others:**

If any part of the CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor, utility owner, or the AUTHORITY, the CONTRACTOR shall inspect and promptly report to the Project Manager in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to so report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in the other work.

### **8.4 Coordination:**

If the AUTHORITY contracts with others for the performance of other work at the site, Project Manager will have authority and responsibility for coordination of the activities among the various prime contractors.

## **ARTICLE 9 - CHANGES**

### **9.1 AUTHORITY's Right to Change**

Without invalidating the Contract and without notice to any Surety, the AUTHORITY may, at any time or from time to time, order additions, deletions or revisions in the Work within the general scope of the Contract, including but not limited to changes:

- 9.1.1 In the Contract Documents;
- 9.1.2 In the method or manner of performance of the Work;
- 9.1.3 In Authority-furnished facilities, equipment, materials, services, or site;
- 9.1.4 Directing acceleration in the performance of the Work.

### **9.2 Authorization of Changes within the General Scope.**

Additions, deletions, or revisions in the Work within the general scope of the Contract as specified in 9.1 shall be authorized by one or more of following ways:

- 9.2.1 Directive (pursuant to paragraph 9.3)
- 9.2.2 A Change Order (pursuant to paragraph 9.4)
- 9.2.3 AUTHORITY's acceptance of Shop Drawing variations from the Contract Documents as specifically identified by the CONTRACTOR as required by paragraph 6.20.4.

### **9.3 Directive**

- 9.3.1 The Contracting Officer shall provide written clarification or interpretation of the Contract Documents (pursuant to paragraph 3.6).
- 9.3.2 The Project Manager may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents.
- 9.3.3 The Project Manager may order the Contractor to correct Defective Work or methods which are not in conformance with the Contract Documents.
- 9.3.4 The Project Manager may direct the commencement or suspension of Work or emergency related Work (as provided in paragraph 6.19).
- 9.3.5 Upon the issuance of a Directive to the CONTRACTOR by the Project Manager, the CONTRACTOR shall proceed with the performance of the Work as prescribed by such Directive.
- 9.3.6 If the CONTRACTOR believes that the changes noted in a Directive may cause an increase in the Contract Price or an extension of Contract Time, the CONTRACTOR shall immediately provide written notice to the Project Manager depicting such increases before proceeding with the Directive, except in the case of an emergency. If the Project Manager finds the increase in Contract Price or the extension of Contract Time justified, a Change Order will be issued. If however, the Project Manager does not find that a Change Order is justified, the Project Manager may direct the CONTRACTOR to proceed with the Work. The CONTRACTOR shall cooperate with the Project Manager in keeping complete daily records of the cost of such Work. If a Change Order is ultimately determined to be justified, in the absence of agreed prices and unit prices, payment for such Work will be made on a "cost of the work basis" as provided in 10.4

### **9.4 Change Order**

A change in Contract Time, Contract Price, or responsibility may be made for changes within the scope of the Work by Change Order. Upon receipt of an executed Change Order, the CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents except as otherwise specifically provided. Changes in Contract Price and Contract Time shall be made in accordance with Articles 10 and 11. A Change Order shall be considered executed when it is signed by the AUTHORITY.

### **9.5 Shop Drawing Variations**

Variations by shop drawings shall only be eligible for consideration under 9.4 when the conditions affecting the price, time, or responsibility are identified by the CONTRACTOR in writing and a request for a Change Order is submitted as per 6.20.4.

### **9.6 Changes Outside the General Scope; Supplemental Agreement**

Any change which is outside the general scope of the Contract, as determined by the Project Manager, must be authorized by a Supplemental Agreement signed by the appropriate representatives of the AUTHORITY and the CONTRACTOR.

## **9.7 Unauthorized Work:**

The CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in this Article 9, except in the case of an emergency as provided in paragraph 6.19 and except in the case of uncovering Work as provided in paragraph 12.4.2.

## **9.8 Notification of Surety:**

If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any bond to be given to a Surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable bond will be adjusted accordingly.

## **9.9 Differing Site Conditions:**

9.9.1 The CONTRACTOR shall promptly, and before such conditions are disturbed (except in an emergency as permitted by paragraph 6.19), notify the Project Manager in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the Contract, and which could not have been discovered by a careful examination of the site, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract. The Project Manager shall promptly investigate the conditions, and if the Project Manager finds that such conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or time required for, performance of this Contract, an equitable adjustment shall be made and the Contract modified in writing accordingly.

9.9.2 Any claim for additional compensation by the CONTRACTOR under this clause shall be made in accordance with Article 15. In the event that the Contracting Officer and the CONTRACTOR are unable to reach an agreement concerning an alleged differing site condition, the CONTRACTOR will be required to keep an accurate and detailed record which will indicate the actual "cost of the work" done under the alleged differing site condition. Failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site conditions. The Project Manager shall be given the opportunity to supervise and check the keeping of such records.

## **9.10 Interim Work Authorization**

An Interim Work Authorization may be used to establish a change within the scope of the Work; however, only a Change Order shall establish associated changes in Contract Time and Price. Work authorized by Interim Work Authorization shall be converted to a Change Order. The basis of payment shall be as stated in the Interim Work Authorization, unless it states that the basis of payment has not been established and is to be negotiated, in which case the Cost of the Work shall be documented pursuant to Article 10.4, to establish a basis for negotiating a lump sum price for the Change Order.

## **ARTICLE 10 - CONTRACT PRICE; COMPUTATION AND CHANGE**

### **10.1 Contract Price:**

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order or Supplemental Agreement.

### **10.2 Claim for Price Change:**

Any claim for an increase or decrease in the Contract Price shall be submitted in accordance with the terms of Article 15, and shall not be allowed unless notice requirements of this Contract have been met.

### **10.3 Change Order Price Determination:**

The value of any Work covered by a Change Order for an increase or decrease in the Contract Price shall be determined in one of the following ways:

10.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of subparagraphs 10.9.1 through 10.9.3, inclusive).

10.3.2 By mutual acceptance of a lump sum price that includes overhead and profit. The following maximum rates of cost markup (to cover both overhead and profit of the CONTRACTOR) shall be used in the negotiation of a Lump Sum Change Order:

- a. 17% - where a cost is borne directly by prime contractor (first tier contractor).
- b. 10% - where a cost is borne by a subcontractor (lower tier contractor).

Where the cost is borne by a subcontractor acting as a first tier contractor, the allowable overhead and profit markup for lump sum change orders shall not exceed 17%. Any lower tier subcontractors, including the CONTRACTOR in this case, for whom the first tier subcontractor performs the work, shall be allowed an overhead and profit markup that does not exceed 10%.

10.3.3 When 10.3.1 and 10.3.2 are inapplicable, on the basis of the "cost of the work" (determined as provided in paragraphs 10.4 and 10.5) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 10.6).

10.3.4 Before a Change Order or Supplemental Agreement is approved, the CONTRACTOR shall submit cost or pricing data regarding the changed or extra Work. The CONTRACTOR shall certify that the data submitted is, to his best knowledge and belief, accurate, complete and current as of a mutually determined specified date and that such data will continue to be accurate and complete during the performance of the changed or extra Work.

### **10.4 Cost of the Work:**

The term "cost of the work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by the AUTHORITY, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in subparagraph 10.5:

- 10.4.1 Payroll costs for employees in the direct employ of the CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by the AUTHORITY and the CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include manual workers up through the level of foreman but shall not include general foremen, superintendents, and non-manual employees. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays shall be included in the above to the extent authorized by the AUTHORITY.
- 10.4.2 Cost of all materials and equipment furnished and incorporated or consumed in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to the CONTRACTOR unless the AUTHORITY deposits funds with the CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to the AUTHORITY. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the AUTHORITY, and the CONTRACTOR shall make provisions so that they may be obtained.
- 10.4.3 Payments made by the CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by the AUTHORITY, CONTRACTOR shall obtain competitive quotes from Subcontractors or Suppliers acceptable to the CONTRACTOR and shall deliver such quotes to the AUTHORITY who will then determine which quotes will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of "cost of the work" plus a fee, the Subcontractor' "cost of the work" shall be determined in the same manner as the CONTRACTOR's "cost of work" as described in paragraphs 10.4 through 10.5; and the Subcontractor's fee shall be established as provided for under subparagraph 10.6.2 clause b. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.
- 10.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services necessary for the completion of the Work.
- 10.4.5 Supplemental costs including the following:
- a. The proportion of necessary transportation, travel and subsistence expenses of the CONTRACTOR's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of the CONTRACTOR.
  - c. Rentals of all construction equipment and machinery and the parts thereof whether rented from the CONTRACTOR or others in accordance with rental agreements Approved by the AUTHORITY and the costs of transportation, loading, unloading, installation, dismantling and removal thereof - all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

For any machinery or special equipment (other than small tools) which has been authorized by

the Project Manager, the CONTRACTOR shall receive the rental rates in the current edition and appropriate volume of the "Rental Rate Blue Book for Construction Equipment", published by Dataquest, Inc., 1290 Ridder Park Drive, San Jose, CA 95131. Hourly rental rates shall be determined as follows:

*The established hourly rental rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 176, and multiplied by the area adjustment factor, plus the estimated hourly operating cost.*

The adjusted monthly rate is that resulting from application of the rate adjustment formula in order to eliminate replacement cost allowances in machine depreciation and contingency cost allowances.

Attachments shall not be included unless required for the time and materials work.

For equipment not listed in The Blue Book, the CONTRACTOR shall receive a rental rate as agreed upon before such work is begun. If agreement cannot be reached, the AUTHORITY reserves the right to establish a rate based on similar equipment in the Blue Book or prevailing commercial rates in the area.

These rates shall apply for equipment used during the CONTRACTOR's regular shift of 10 hours per day. Where the equipment is used more than 10 hours per day, either on the CONTRACTOR's normal work or on time and materials, and either on single or multiple shifts, an overtime rate, computed as follows, shall apply:

*The hourly overtime rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 352, and multiplied by the area adjustment factor, plus the estimated hourly operating cost.*

Equipment which must be rented or leased specifically for work required under this section shall be authorized in writing by the Project Manager. The CONTRACTOR shall be paid invoice price plus 15%.

When it is necessary to obtain equipment from sources beyond the project limits exclusively for time and materials, work, the actual cost of transferring the equipment to the site of the work and return will be allowed as an additional item of expense. Where the move is made by common carrier, the move-in allowance will be limited to the amount of the freight bill or invoice. If the CONTRACTOR hauls the equipment with his own forces, the allowance will be limited to the rental rate for the hauling unit plus operator wages. In the event that the equipment is transferred under its own power, the moving allowance will be limited to one-half of the normal hourly rental rate plus operator's wages. In the event that the move-out is to a different location, payment will in no instance exceed the amount of the move-in. Move-in allowance shall not be made for equipment brought to the project for time and materials work which is subsequently retained on the project and utilized for completion of contract items, camp maintenance, or related work.

Equipment ordered to be on a stand-by basis shall be paid for at the stand-by rental rate for the number of hours in the CONTRACTOR'S normal work shift, but not to exceed 8 hours per day. The stand-by rental rate shall be computed as follows:

*The hourly stand-by rate shall be equal to the adjusted monthly rate for the basic equipment plus the adjusted monthly rate for applicable attachments, both divided by 352, all multiplied by the area adjustment factor.*

Time will be recorded to the nearest one-quarter hour for purposes of computing compensation to the CONTRACTOR for equipment utilized under these rates.

The equipment rates as determined above shall be full compensation, including overhead and profit, for providing the required equipment and no additional compensation will be made for other costs such as, but not limited to, fuels, lubricants, replacement parts or maintenance costs. Cost of repairs, both major and minor, as well as charges for mechanic's time utilized in servicing equipment to ready it for use prior to moving to the project and similar charges will not be allowed.

- d. Sales, consumer, use or similar taxes related to the Work, and for which the CONTRACTOR is liable, imposed by Regulatory Requirements.
- e. Deposits lost for causes other than negligence of the CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by the CONTRACTOR in connection with the performance and furnishing of the Work provided they have resulted from causes other than the negligence of the CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and Approval of the AUTHORITY. No such losses, damages and expenses shall be included in the "cost of the work" for the purpose of determining the CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and the CONTRACTOR is placed in charge thereof, the CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraphs 10.6.2.a and 10.6.2.b.
- g. The cost of utilities, fuel and sanitary facilities at the site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.
- I. Cost of premiums for additional bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by the AUTHORITY in accordance with Article 5.

## **10.5 Excluded Costs:**

The term "cost of the work" shall not include any of the following:

- 10.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing agency, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 or specifically covered by paragraph 10.4.4 all of which are to be considered administrative costs covered by the CONTRACTOR's fee.
- 10.5.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

- 10.5.3 Any part of CONTRACTOR's capital expenses including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
- 10.5.4 Cost of premiums for all bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 10.4.5.i above).
- 10.5.5 Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.
- 10.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4.

**10.6 CONTRACTOR's Fee:**

The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows.

- 10.6.1 A mutually acceptable fixed fee; or if none can be agreed upon.
- 10.6.2 A fee based on the following percentages of the various portions of the "cost of the work":
  - a. For costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR's fee shall be twenty percent;
  - b. For costs incurred under paragraph 10.4.3, the CONTRACTOR's fee shall be ten percent; and if a subcontract is on the basis of "cost of the work" plus a fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all Subcontractors and multiple tiers thereof shall be fifteen percent;
  - c. No fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;
  - d. The amount of credit to be allowed by the CONTRACTOR to the AUTHORITY for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR's fee by an amount equal to ten percent of the net decrease; and
  - e. When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 10.6.2.a through 10.6.2.d, inclusive.

**10.7 Cost Breakdown:**

Whenever the cost of any Work is to be determined pursuant to paragraphs 10.4 and 10.5, the CONTRACTOR will submit in a form acceptable to the AUTHORITY an itemized cost breakdown together with supporting data.

**10.8 Cash Allowances:**

It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors

or Suppliers and for such sums within the limit of the allowances as may be acceptable to the Contracting Officer. CONTRACTOR agrees that:

- 10.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and
- 10.8.2 CONTRACTOR's cost for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due the CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

**10.9 Unit Price Work:**

- 10.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR will be made by the AUTHORITY in accordance with paragraph 10.10.
- 10.9.2 Each unit price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the CONTRACTOR's overhead and profit for each separately identified item. If the "Basis of Payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.
- 10.9.3 Payment to the CONTRACTOR shall be made only for the actual quantities of Work performed and accepted or materials furnished, in conformance with the Contract Documents. When the accepted quantities of Work or materials vary from the quantities stated in the bid schedule, or change documents, the CONTRACTOR shall accept as payment in full, payment at the stated unit prices for the accepted quantities of Work and materials furnished, completed and accepted; except as provided below:
  - a. When the quantity of Work to be done or material to be furnished under any item, for which the total cost of the item exceeds 10% of the total Contract Price, is increased by more than 25 percent of the quantity stated in the bid schedule, or change documents, either party to the Contract, upon demand, shall be entitled to an equitable unit price adjustment on that portion of the Work above 125 percent of the quantity stated in the bid schedule.
  - b. When the quantity of Work to be done or material to be furnished under any major item, for which the total cost of the item exceeds 10% of the total Contract Price, is decreased by more than 25 percent of the quantity stated in the bid schedule, or change documents either party to the Contract, upon demand, shall be entitled to an equitable price adjustment for the quantity

of Work performed or material furnished, limited to a total payment of not more than 75 percent of the amount originally bid for the item.

#### **10.10 Determinations for Unit Prices:**

The Project Manager will determine the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR. The Project Manager will review with the CONTRACTOR preliminary determinations on such matters before finalizing the costs and quantities on the Schedule of Values. The Project Manager's acknowledgment thereof will be final and binding on the CONTRACTOR, unless, within 10 days after the date of any such decisions, the CONTRACTOR delivers to the Project Manager written notice of intention to appeal from such a decision.

### **ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE**

#### **11.1 Commencement of Contract Time; Notice to Proceed:**

The Contract Time will commence to run on the day indicated in the Notice to Proceed.

#### **11.2 Starting the Work:**

No Work on Contract items shall be performed before the effective date of the Notice to Proceed. The CONTRACTOR shall notify the Project Manager at least 24 hours in advance of the time actual construction operations will begin. The CONTRACTOR may request a limited Notice to Proceed after Award has been made, to permit him to order long lead materials which could cause delays in Project completion. However, granting is within the sole discretion of the Contracting Officer, and refusal or failure to grant a limited Notice to Proceed shall not be a basis for claiming for delay, extension of time, or alteration of price.

#### **11.3 Computation of Contract Time:**

11.3.1 When the Contract Time is specified on a Calendar Day basis, all Work under the Contract shall be completed within the number of Calendar Days specified. The count of Contract Time begins on the day following receipt of the Notice to Proceed by the CONTRACTOR, if no starting day is stipulated therein.

Calendar Days shall continue to be counted against Contract Time until and including the date of Substantial Completion of the Work.

11.3.2 When the Contract completion time is specified as a fixed calendar date, it shall be the date of Final Completion.

11.3.3 The Contract Time shall be as stated in 00800, Supplementary Conditions.

#### **11.4 Time Change:**

The Contract Time may only be changed by a Change Order or Supplemental Agreement.

#### **11.5 Extension Due to Delays:**

The right of the CONTRACTOR to proceed shall not be terminated nor the CONTRACTOR charged with liquidated or actual damages because of delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the

CONTRACTOR, including, but not restricted to the following: acts of God or of the public enemy, acts of the AUTHORITY in its contractual capacity, acts of another contractor in the performance of a contract with the AUTHORITY, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather and delays of Subcontractors or Suppliers due to such causes. Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension, provided that the CONTRACTOR shall within twenty four (24) hours from the beginning of any such delay (unless the Contracting Officer shall grant a further period of the time prior to the date of final settlement of the Contract), notify the Project Manager in writing of the cause of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

#### **11.6 Essence of Contract:**

All time limits stated in the Contract Documents are of the essence of the Contract.

#### **11.7 Reasonable Completion Time:**

It is expressly understood and agreed by and between the CONTRACTOR and the AUTHORITY that the date of beginning and the time for Substantial Completion of the Work described herein are reasonable times for the completion of the Work.

#### **11.8 Delay Damages:**

Whether or not the CONTRACTOR's right to proceed with the Work is terminated, he and his Sureties shall be liable for damages resulting from his refusal or failure to complete the Work within the specified time.

Liquidated and actual damages for delay shall be paid by the CONTRACTOR or his Surety to the AUTHORITY in the amount as specified in the Supplementary Conditions for each Calendar Day the completion of the Work or any part thereof is delayed beyond the time required by the Contract, or any extension thereof. If a listing of incidents resulting from a delay and expected to give rise to actual or liquidated damages is not established by the Contract Documents, then the CONTRACTOR and his Surety shall be liable to the AUTHORITY for any actual damages occasioned by such delay. The CONTRACTOR acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the AUTHORITY will sustain by reason of delayed completion. These liquidated and actual damages are intended as compensation for losses anticipated arising, and including those items enumerated in the Supplementary Conditions.

These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion or AUTHORITY costs, fees, and charges related to reprocurement. If a default termination occurs, the CONTRACTOR or his Surety shall pay in addition to these damages, all excess costs and expenses related to completion as provided by Article 14.2.5.

For each calendar day that the work remains incomplete after the expiration of the Contract Time, liquidated damages in the amount as stated in 00800, Supplemental Conditions shall be assessed to the CONTRACTOR. If no money is due the CONTRACTOR, the AUTHORITY shall have the right to recover said sum from the CONTRACTOR, the surety or both. The amount of these deductions is to reimburse the AUTHORITY for estimated liquidated damages incurred as a result of the CONTRACTOR's failure to complete the work within the time specified. As liquidated

damages, such deductions are not to be considered as penalties.

Permitting the CONTRACTOR to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the AUTHORITY of any of its rights under the Contract.

## **ARTICLE 12 - QUALITY ASSURANCE**

### **12.1 Warranty and Guaranty:**

The CONTRACTOR warrants and guarantees to the AUTHORITY that all Work will be in accordance with the Contract Documents and will not be Defective. Prompt notice of all defects shall be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected or accepted as provided for in this article.

### **12.2 Access to Work:**

The AUTHORITY and the AUTHORITY's consultants, testing agencies and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. The CONTRACTOR shall provide proper and safe conditions for such access.

### **12.3 Tests and Inspections:**

- 12.3.1 The CONTRACTOR shall give the Project Manager timely notice of readiness of the Work for all required inspections, tests or Approvals.
- 12.3.2 If Regulatory Requirements of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, the CONTRACTOR shall assume full responsibility therefore, pay all costs in connection therewith and furnish the Project Manager the required certificates of inspection, testing or approval. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with AUTHORITY's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for Approval prior to the CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals in addition to the above which are required by the Contract Documents shall be paid by the CONTRACTOR. The AUTHORITY may perform additional tests and inspections which it deems necessary to insure quality control. All such failed tests or inspections shall be at the CONTRACTOR's expense.
- 12.3.4 If any Work (including the work of others) that is to be inspected, tested or Approved is covered without written concurrence of the Project Manager, it must, if requested by the Project Manager, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the Project Manager timely notice of CONTRACTOR's intention to cover the same and the Project Manager has not acted with reasonable promptness in response to such notice.
- 12.3.5 Neither observations nor inspections, tests or Approvals by the AUTHORITY or others shall relieve the CONTRACTOR from the CONTRACTOR's obligations to perform the Work in accordance with the Contract Documents.

## **12.4 Uncovering Work:**

12.4.1 If any Work is covered contrary to the written request of the Project Manager, it must, if requested by the Project Manager, be uncovered for the Project Manager's observation and replaced at the CONTRACTOR's expense.

12.4.2 If the Project Manager considers it necessary or advisable that covered Work be observed inspected or tested, the CONTRACTOR, at the Project Manager's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Project Manager may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is Defective, the CONTRACTOR shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) and the AUTHORITY shall be entitled to an appropriate decrease in the Contract Price. If, however, such Work is not found to be Defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.

## **12.5 AUTHORITY May Stop the Work:**

If the Work is Defective, or the CONTRACTOR fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Contracting Officer may order the CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Contracting Officer to stop the Work shall not give rise to any duty on the part of the Contracting Officer to exercise this right for the benefit of the CONTRACTOR or any other party.

## **12.6 Correction or Removal of Defective Work:**

If required by the Project Manager, the CONTRACTOR shall promptly, as directed, either correct all Defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Project Manager, remove it from the site and replace it with Work which conforms to the requirements of the Contract Documents. The CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

## **12.7 One Year Correction Period:**

If within one year after the date of Substantial Completion of the relevant portion of the Work or such longer period of time as may be prescribed by Regulatory Requirements or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be Defective, the CONTRACTOR shall promptly, without cost to the AUTHORITY and in accordance with the Project Manager's written instructions, either correct such Defective Work, or, if it has been rejected by the Project Manager, remove it from the site and replace it with conforming Work. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the AUTHORITY may have the Defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service for the benefit of the

AUTHORITY before Substantial Completion of all the Work, the correction period for that item may begin on an earlier date if so provided in the Specifications or by Change Order. Provisions of this paragraph are not intended to shorten the statute of limitations for bringing an action.

#### **12.8 Acceptance of Defective Work:**

Instead of requiring correction or removal and replacement of Defective Work, the Project Manager may accept Defective Work, the CONTRACTOR shall bear all direct, indirect and consequential costs attributable to the Project Manager's evaluation of and determination to accept such Defective Work (costs to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the AUTHORITY shall be entitled to an appropriate decrease in the Contract Price. If the AUTHORITY has already made final payment to the CONTRACTOR, an appropriate amount shall be paid by the CONTRACTOR or his Surety to the AUTHORITY.

#### **12.9 AUTHORITY May Correct Defective Work:**

If the CONTRACTOR fails within a reasonable time after written notice from the Project Manager to proceed to correct Defective Work or to remove and replace rejected Work as required by the Project Manager in accordance with paragraph 12.6, or if the CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the AUTHORITY may, after 7 days' written notice to the CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph the AUTHORITY shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the Project Manager may exclude the CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend the CONTRACTOR's services related thereto, take possession of the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or approved remote storage sites or for which the AUTHORITY has paid the CONTRACTOR but which are stored elsewhere. The CONTRACTOR shall allow the Project Manager and his authorized representatives such access to the site as may be necessary to enable the Project Manager to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of the AUTHORITY in exercising such rights and remedies will be charged against the CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the AUTHORITY shall be entitled to an appropriate decrease in the Contract Price. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the CONTRACTOR's Defective Work. The CONTRACTOR shall not be allowed an extension of time because of any delay in performance of the work attributable to the exercise, by the Project Manager, of the AUTHORITY's rights and remedies hereunder.

### **ARTICLE 13 - PAYMENTS TO CONTRACTOR AND COMPLETION**

#### **13.1 Schedule of Values:**

The Schedule of Values established as provided in paragraph 6.6 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Project Manager. Progress payments on account of Unit Price Work will be based on the number of units completed.

### **13.2 Preliminary Payments:**

Upon approval of the Schedule of Values the CONTRACTOR may be paid for direct costs substantiated by paid invoices and other prerequisite documents required by the General Requirements. Direct costs shall include the cost of bonds, insurance, approved materials stored on the site or at approved remote storage sites, deposits required by a Supplier prior to fabricating materials, and other approved direct mobilization costs substantiated as indicated above. These payments shall be included as a part of the total Contract Price as stated in the Contract.

### **13.3 Application for Progress Payment:**

The CONTRACTOR shall submit to the Project Manager for review an Application for Payment filled out and signed by the CONTRACTOR covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents. Progress payments will be made as the Work progresses on a monthly basis.

### **13.4 Review of Applications for Progress Payment:**

Project Manager will either indicate in writing a recommendation of payment or return the Application for Payment to the CONTRACTOR indicating in writing the Project Manager's reasons for refusing to recommend payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the Application for Payment.

### **13.5 Stored Materials and Equipment:**

If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, paid invoice or other documentation warranting that the AUTHORITY has received the materials and equipment free and clear of all charges, security interests and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the AUTHORITY's interest therein, all of which will be satisfactory to the Project Manager. No payment will be made for perishable materials that could be rendered useless because of long storage periods. No progress payment will be made for living plant materials until planted.

### **13.6 CONTRACTOR's Warranty of Title:**

The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the AUTHORITY no later than the time of payment free and clear of any claims, liens, security interests and further obligations.

### **13.7 Withholding of Payments:**

The AUTHORITY may withhold or refuse payment for any of the reasons listed below provided it gives written notice of its intent to withhold and of the basis for withholding:

13.7.1 The Work is Defective, or completed Work has been damaged requiring correction or replacement, or has been installed without Approval of Shop Drawings, or by an unapproved Subcontractor, or for unsuitable storage of materials and equipment.

13.7.2 The Contract Price has been reduced by Change Order,

- 13.7.3 The AUTHORITY has been required to correct Defective Work or complete Work in accordance with paragraph 12.9.
- 13.7.4 The AUTHORITY's actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.1.a through 14.2.1.k inclusive.
- 13.7.5 Claims have been made against the AUTHORITY or against the funds held by the AUTHORITY on account of the CONTRACTOR's actions or inactions in performing this Contract, or there are other items entitling the AUTHORITY to a set off.
- 13.7.6 Subsequently discovered evidence or the results of subsequent inspections or test, nullify any previous payments for reasons stated in subparagraphs 13.7.1 through 13.7.5.
- 13.7.7 The CONTRACTOR has failed to fulfill or is in violation of any of his obligations under any provision of this Contract.

**13.8 Retainage:**

At any time the AUTHORITY finds that satisfactory progress is not being made it may in addition to the amounts withheld under 13.7 retain a maximum amount equal to 10% of the total amount earned on all subsequent progress payments. This retainage may be released at such time as the Project Manager finds that satisfactory progress is being made.

**13.9 Request for Release of Funds:**

If the CONTRACTOR believes the basis for withholding is invalid or no longer exists, immediate written notice of the facts and Contract provisions on which the CONTRACTOR relies, shall be given to the AUTHORITY, together with a request for release of funds and adequate documentary evidence proving that the problem has been cured. In the case of withholding which has occurred at the request of the Department of Labor, the CONTRACTOR shall provide a letter from the Department of Labor stating that withholding is no longer requested. Following such a submittal by the CONTRACTOR, the AUTHORITY shall have a reasonable time to investigate and verify the facts and seek additional assurances before determining whether release of withheld payments is justified.

**13.10 Substantial Completion:**

When the CONTRACTOR considers the Work ready for its intended use the CONTRACTOR shall notify the Project Manager in writing that the Work or a portion of Work which has been specifically identified in the Contract Documents is substantially complete (except for items specifically listed by the CONTRACTOR as incomplete) and request that the AUTHORITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, the Project Manager, the CONTRACTOR and Engineer(s) shall make an inspection of the Work to determine the status of completion. If the Project Manager does not consider the Work substantially complete, the Project Manager will notify the CONTRACTOR in writing giving the reasons therefore. If the Project Manager considers the Work substantially complete, the Project Manager will within fourteen days execute and deliver to the CONTRACTOR a certificate of Substantial Completion with tentative list of items to be completed or corrected. At the time of delivery of the certificate of Substantial Completion the Project Manager will deliver to the CONTRACTOR a written division of responsibilities pending Final Completion with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties which shall be consistent with the terms of the Contract Documents.

The AUTHORITY shall be responsible for all AUTHORITY costs resulting from the initial inspection and the first re-inspection, the CONTRACTOR shall pay all costs incurred by the AUTHORITY resulting from re-inspections, thereafter.

### **13.11 Access Following Substantial Completion:**

The AUTHORITY shall have the right to exclude the CONTRACTOR from the Work after the date of Substantial Completion, but the AUTHORITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

### **13.12 Final Inspection:**

Upon written notice from the CONTRACTOR that the entire Work or an agreed portion thereof is complete, the Project Manager will make a final inspection with the CONTRACTOR and Engineer(s) and will notify the CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or Defective. The CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies. The CONTRACTOR shall pay for all costs incurred by the AUTHORITY resulting from re-inspections.

### **13.13 Final Completion and Application for Payment:**

After the CONTRACTOR has completed all such corrections to the satisfaction of the Project Manager and delivered schedules, guarantees, bonds, certificates of payment to all laborers, Subcontractors and Suppliers, and other documents - all as required by the Contract Documents; and after the Project Manager has indicated in writing that the Work has met the requirements for Final Completion, and subject to the provisions of paragraph 13.18, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all remaining certificates, warranties, guarantees, releases, affidavits, and other documentation required by the Contract Documents.

### **13.14 Final Payment:**

13.14.1 If on the basis of the Project Manager's observation of the Work during construction and final inspection, and the Project Manager's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents; and the Project Manager is satisfied that the Work has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the AUTHORITY will process final Application for Payment. Otherwise, the Project Manager will return the Application for Payment to the CONTRACTOR, indicating in writing the reasons for refusing to process final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the final Application for Payment.

13.14.2 If, through no fault of the CONTRACTOR, Final Completion of the Work is significantly delayed, the Project Manager shall, upon receipt of the CONTRACTOR's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the AUTHORITY for Work not fully completed or corrected is less than the retainage provided for in paragraph 13.9, and if bonds have been furnished as required in paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the CONTRACTOR to the AUTHORITY with the application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

### **13.15 Final Acceptance:**

Following certification of payment of payroll and revenue taxes, and final payment to the CONTRACTOR, the AUTHORITY will issue a letter of Final Acceptance, releasing the CONTRACTOR from further obligations under the Contract, except as provided in paragraph 13.17.

When it is anticipated that restarting, testing, adjusting, or balancing of systems will be required following Final Acceptance and said requirements are noted in Section(s) 01 77 00, such Work shall constitute a continuing obligation under the Contract.

### **13.16 CONTRACTOR's Continuing Obligation:**

The CONTRACTOR's obligation to perform and complete the Work and pay all laborers, Subcontractors, and material men in accordance with the Contract Documents shall be absolute. Neither any progress or final payment by the AUTHORITY, nor the issuance of a certificate of Substantial Completion, nor any use or occupancy of the Work or any part thereof by the AUTHORITY or Owner, nor any act of acceptance by the AUTHORITY nor any failure to do so, nor any review and Approval of a Shop Drawing or sample submission, nor any correction of Defective Work by the AUTHORITY will constitute an acceptance of Work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

### **13.17 Waiver of Claims by CONTRACTOR:**

The making and acceptance of final payment will constitute a waiver of all claims by the CONTRACTOR against the AUTHORITY other than those previously made in writing and still unsettled.

### **13.18 No Waiver of Legal Rights:**

The AUTHORITY shall not be precluded or be estopped by any payment, measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefore, from showing the true amount and character of the Work performed and materials furnished by the CONTRACTOR, nor from showing that any payment, measurement, estimate or certificate is untrue or is incorrectly made, or that the Work or materials are Defective. The AUTHORITY shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the CONTRACTOR or his Sureties, or both, such damages as it may sustain by reason of his failure to comply with requirements of the Contract Documents. Neither the acceptance by the AUTHORITY, or any representative of the AUTHORITY, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of the Contract Time, nor any possession taken by the AUTHORITY, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages. A waiver by the AUTHORITY of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

## **ARTICLE 14 - SUSPENSION OF WORK, DEFAULT AND TERMINATION**

### **14.1 AUTHORITY May Suspend Work:**

14.1.1 The AUTHORITY may, at any time, suspend the Work or any portion thereof by notice in writing to the CONTRACTOR. If the Work is suspended without cause the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both,

directly attributable to any suspension if the CONTRACTOR makes an Approved claim therefore as provided in Article 15. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that suspension is due to the fault or negligence of the CONTRACTOR, or that suspension is necessary for Contract compliance, or that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the CONTRACTOR.

14.1.2 In case of suspension of Work, the CONTRACTOR shall be responsible for preventing damage to or loss of any of the Work already performed and of all materials whether stored on or off the site or Approved remote storage sites.

## **14.2 Default of Contract:**

14.2.1 The Contracting Officer may give the contractor and his surety a written Notice to Cure Default if the contractor:

- a. fails to begin work in the time specified,
- b. fails to use sufficient resources to assure prompt completion of the work,
- c. performs the work unsuitably or neglect or refuse to remove and replace rejected materials or work,
- d. stops work,
- e. fails to resume stopped work after receiving notice to do so,
- f. becomes insolvent (except that if you declare bankruptcy, termination will be under Title 11 US Code 362 and/or 365. Your bankruptcy does not relieve the surety of any obligations to assume the Contract and complete the work in a timely manner.
- g. Allows any final judgment to stand against him unsatisfied for period of 60 days, or
- h. Makes an assignment for the benefit of creditors without the consent of the Contracting Officer, or
- i. Disregards Regulatory Requirements of any public body having jurisdiction, or
- j. Otherwise violates in any substantial way any provisions of the Contract Documents, or
- k. fails to comply with Contract minimum wage payments or civil rights requirements, or
- l. are party to fraud, deception, misrepresentation , or
- m. for any cause whatsoever, fails to carry on the Work in an acceptable manner.

14.2.2 The Notice to Cure Default will detail the conditions determined to be in default, the time within which to cure the default and may, in the Contracting Officer's discretion, specify the actions necessary to cure the default. Failure to cure the delay, neglect or default within the time specified in the Contracting Officer's written notice to cure authorizes the Authority to terminate the contract. The Contracting Officer may allow more time to cure than originally stated in the Notice to Cure Default if he deems it to be in the best interests of the Authority. The Authority will provide you and your surety with a written Notice of Default Termination that details the default and the failure to cure it.

- 14.2.3 If the CONTRACTOR or Surety, within the time specified in the above notice of default, shall not proceed in accordance therewith, then the AUTHORITY may, upon written notification from the Contracting Officer of the fact of such delay, neglect or default and the CONTRACTOR's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the CONTRACTOR. The AUTHORITY may terminate the services of the CONTRACTOR, exclude the CONTRACTOR from the site and take possession of the Work and of all the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by the CONTRACTOR (without liability to the CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the AUTHORITY has paid the CONTRACTOR but which are stored elsewhere, and finish the Work as the AUTHORITY may deem expedient. The AUTHORITY may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods that in the opinion of the Contracting Officer are required for the completion of said Contract in an acceptable manner.
- 14.2.4 The Contracting Officer may, by written notice to the CONTRACTOR and his Surety or his representative, transfer the employment of the Work from the CONTRACTOR to the Surety, or if the CONTRACTOR abandons the Work undertaken under the Contract, the Contracting Officer may, at his option with written notice to the Surety and without any written notice to the CONTRACTOR, transfer the employment for said Work directly to the Surety. The Surety shall submit its plan for completion of the Work, including any contracts or agreements with third parties for such completion, to the AUTHORITY for Approval prior to beginning completion of the Work. Approval of such contracts shall be in accordance with all applicable requirements and procedures for Approval of subcontracts as stated in the Contract Documents.
- 14.2.5 After the notice of termination is issued, the Authority may take over the work and complete it by contract or otherwise and may take possession of and use materials, appliances, equipment or plant on the work site necessary for completing the work.
- 14.2.6 Rather than taking over the work itself, the Authority may transfer the obligation to perform the work from the contractor to your surety. The surety must submit its plan for completion of the work, including any contracts or agreements with third parties for completion, to the Authority for approval prior to beginning work. The surety must follow the Contract requirements for approval of subcontracts, except that the limitation on percent of work subcontracted will not apply.
- 14.2.7 On receipt of the transfer notice, the surety must take possession of all materials, tools, and appliances at the work site, employ an appropriate work force, and complete the Contract work, as specified. The Contract specifications and requirements shall remain in effect. However the Authority will make subsequent Contract payments directly to the Surety for work performed under the terms of the Contract. CONTRACTOR forfeits any right to claim for the same work or any part thereof. CONTRACTOR is not entitled to receive any further balance of the amount to be paid under the Contract.
- 14.2.8 Upon receipt of the notice terminating the services of the CONTRACTOR, the Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the Work included under the Contract and employ by contract or otherwise any person or persons to finish the Work and provide the materials therefore, without termination of the continuing full force and effect of this Contract. In case of such transfer of employment to the Surety, the Surety shall be paid in its own name on estimates covering Work subsequently performed under the terms of the Contract and according to the terms thereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.

- 14.2.9 If the Contract is terminated for default, the CONTRACTOR and the Surety shall be jointly and severally liable for damages for delay as provided by paragraph 11.8, and for the excess cost of completion, and all costs and expenses incurred by the AUTHORITY in completing the Work or arranging for completion of the Work, including but not limited to costs of assessing the Work to be done, costs associated with advertising, soliciting or negotiating for bids or proposals for completion, and other procurement costs. Following termination the CONTRACTOR shall not be entitled to receive any further balance of the amount to be paid under the Contract until the Work is fully finished and accepted, at which time if the unpaid balance exceeds the amount due the AUTHORITY and any amounts due to persons for whose benefit the AUTHORITY has withheld funds, such excess shall be paid by the AUTHORITY to the CONTRACTOR. If the damages, costs, and expenses due the AUTHORITY exceed the unpaid balance, the CONTRACTOR and his Surety shall pay the difference.
- 14.2.10 If, after notice of termination of the CONTRACTOR's right to proceed under the provisions of this clause, it is determined for any reason that the CONTRACTOR was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, or that termination was wrongful, the rights and obligations of the parties shall be determined in accordance with the clause providing for convenience termination.

### **14.3 Rights or Remedies:**

Where the CONTRACTOR's services have been so terminated by the AUTHORITY, the termination will not affect any rights or remedies of the AUTHORITY against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due the CONTRACTOR by the AUTHORITY will not release the CONTRACTOR from liability.

### **14.4 Convenience Termination:**

- 14.4.1 The performance of the Work may be terminated by the AUTHORITY in accordance with this section in whole or in part, whenever, for any reason the Contracting Officer shall determine that such termination is in the best interest of the OWNER. Any such termination shall be effected by delivery to the CONTRACTOR of a Notice of Termination, specifying termination is for the convenience of the AUTHORITY the extent to which performance of Work is terminated, and the date upon which such termination becomes effective.
- 14.4.2 Immediately upon receipt of a Notice of Termination and except as otherwise directed by the Contracting Officer, the CONTRACTOR shall:
- a. Stop Work on the date and to the extent specified in the Notice of Termination;
  - b. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the Work as is not terminated;
  - c. Terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the Notice of Termination;
  - d. With the written Approval of the Contracting Officer, to the extent he may require, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the Contract;

- e. Submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Contracting Officer;
- f. Transfer to the Contracting Officer the completed or partially completed record drawings, Shop Drawings, information, and other property which, if the Contract had been completed, would be required to be furnished to the AUTHORITY;
- g. Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to the Contract which is in the possession of the CONTRACTOR and in which the AUTHORITY has or may acquire any interest.

The CONTRACTOR shall proceed immediately with the performance of the above obligations.

14.4.3 When the AUTHORITY orders termination of the Work effective on a certain date, all Work in place as of that date will be paid for in accordance with Article 13 of the Contract. Materials required for completion and on hand but not incorporated in the Work will be paid for at invoice cost plus 15 % with materials becoming the property of the AUTHORITY - or the CONTRACTOR may retain title to the materials and be paid an agreed upon lump sum. Materials on order shall be cancelled, and the AUTHORITY shall pay reasonable factory cancellation charges with the option of taking delivery of the materials in lieu of payment of cancellation charges. The CONTRACTOR shall be paid 10% of the cost, freight not included, of materials cancelled, and direct expenses only for CONTRACTOR chartered freight transport which cannot be cancelled without charges, to the extent that the CONTRACTOR can establish them. The extra costs due to cancellation of bonds and insurance and that part of job start-up and phase-out costs not amortized by the amount of Work accomplished shall be paid by the AUTHORITY. Charges for loss of profit or consequential damages shall not be recoverable except as provided above.

- a. The following costs are not payable under a termination settlement agreement or Contracting Officer's determination of the termination claim:
  - 1. Loss of anticipated profits or consequential or compensatory damages
  - 2. Unabsorbed home office overhead (also termed "General & Administrative Expense") related to ongoing business operations
  - 3. Bidding and project investigative costs
  - 4. Direct costs of repairing equipment to render it operable for use on the terminated work

14.4.4 The termination claim shall be submitted promptly, but in no event later than 90 days from the effective date of termination, unless extensions in writing are granted by the Contracting Officer upon written request of the CONTRACTOR made within the 90 day period. Upon failure of the CONTRACTOR to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall thereupon pay to the CONTRACTOR the amount so determined.

14.4.5 The CONTRACTOR and the Contracting Officer may agree upon whole or any part of the amount or amounts to be paid to the CONTRACTOR by reason of the total or partial termination of Work pursuant to this section. The Contract shall be amended accordingly, and the CONTRACTOR shall be paid the agreed amount.

14.4.6 In the event of the failure of the CONTRACTOR and the Contracting Officer to agree in whole or in part, as provided heretofore, as to the amounts with respect to costs to be paid to the CONTRACTOR in connection with the termination of the Work the Contracting Officer shall determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall pay to the CONTRACTOR the amount determined as follows:

- a. All costs and expenses reimbursable in accordance with the Contract not previously paid to the CONTRACTOR for the performance of the Work prior to the effective date of the Notice of Termination;
- b. So far as not included under "a" above, the cost of settling and paying claims arising out of the termination of the Work under subcontracts or orders which are properly chargeable to the terminated portions of the Contract;
- c. So far as practicable, claims by the contractor for idled or stand-by equipment shall be made as follows: Equipment claims will be reimbursed as follows:
  1. Contractor-owned equipment usage, based on the contractor's ownership and operating costs for each piece of equipment as determined from the contractor's accounting records. Under no circumstance, may the contractor base equipment claims on published rental rates.
  2. Idle or stand-by time for Contractor-owned equipment, based on your internal ownership and depreciation costs. Idle or stand-by equipment time is limited to the actual period of time equipment is idle or on stand-by as a direct result of the termination, not to exceed 30 days. Operating expenses will not be included for payment of idle or stand-by equipment time.
  3. Rented equipment, based on reasonable, actual rental costs. Equipment leased under "capital leases" as defined in Financial Accounting Standard No. 13 will be considered Contractor-owned equipment. Equipment leased from an affiliate, division, subsidiary or other organization under common control with you will be considered Contractor-owned equipment, unless the lessor has an established record of leasing to unaffiliated lessees at competitive rates consistent with the rates you have agreed to pay and no more than forty percent of the lessor's leasing business, measured in dollars, is with organizations affiliated with the lessor.

14.4.7 The CONTRACTOR shall have the right of appeal under the AUTHORITY's claim procedures, as defined in Article 15, for any determination made by the Contracting Officer, except if the CONTRACTOR has failed to submit his claim within the time provided and has failed to request extension of such time, CONTRACTOR shall have no such right of appeal. In arriving at the amount due the CONTRACTOR under this section, there shall be deducted:

- a. All previous payments made to the CONTRACTOR for the performance of Work under the Contract prior to termination;
- b. Any claim for which the AUTHORITY may have against the CONTRACTOR;
- c. The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the CONTRACTOR or sold pursuant to the provisions of this section and not otherwise recovered by or credited to the AUTHORITY; and,
- d. All progress payments made to the CONTRACTOR under the provisions of this section.

- 14.4.8 Where the Work has been terminated by the AUTHORITY said termination shall not affect or terminate any of the rights of the AUTHORITY against the CONTRACTOR or his Surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the AUTHORITY due to the CONTRACTOR under the terms of the Contract shall not release the CONTRACTOR or his Surety from liability.
- 14.4.9 The contractor's termination claim may not include claims that pre dated the notice for termination for convenience. Those claims shall be prosecuted by the contractor under Article 15.
- 14.4.10 The contractor's termination claim may not exceed the total dollar value of the contract as awarded plus agreed upon change orders less the amounts that have been paid for work completed.
- a. Unless otherwise provided for in the Contract Documents, or by applicable statute, the CONTRACTOR, from the effective date of termination and for a period of three years after final settlement under this Contract, shall preserve and make available to the AUTHORITY at all reasonable times at the office of the CONTRACTOR, all its books, records, documents, and other evidence bearing on the cost and expenses of the CONTRACTOR under his Contract and relating to the Work terminated hereunder.
  - b. Cost Principles. The Authority may use the federal cost principles at 48 CFR §§ 31.201-1 to 31.205-52 (or succeeding cost principles for fixed price contracts) as guidelines in determining allowable costs under this Subsection to the extent they are applicable to construction contracts and consistent with the specifications of this Contract. The provisions of this contract control where they are more restrictive than, or inconsistent with, these federal cost principles.”

## **ARTICLE 15 - CLAIMS AND DISPUTES**

### **15.1 Notification**

- 15.1.1 The CONTRACTOR shall notify the AUTHORITY in writing as soon as the CONTRACTOR becomes aware of any act or occurrence which may form the basis of a claim for additional compensation or an extension of Contract Time or of any dispute regarding a question of fact or interpretation of the Contract. The AUTHORITY has no obligation to investigate any fact or occurrence that might form the basis of a claim or to provide any additional compensation or extension of Contract Time unless the CONTRACTOR has notified the AUTHORITY in writing in a timely manner of all facts the CONTRACTOR believes form the basis for the claim.
- 15.1.2 If the CONTRACTOR believes that he is entitled to an extension of Contract Time, then the CONTRACTOR must state the contract section on which he basis his extension request, provide the AUTHORITY with sufficient information to demonstrate that the CONTRACTOR has suffered excusable delay, and show the specific amount of time to which the CONTRACTOR is entitled. The AUTHORITY will not grant an extension of Contract Time if the CONTRACTOR does not timely submit revised schedules under **Section 01 32 00**.
- 15.1.3 If the matter is not resolved by agreement within 7 days, the CONTRACTOR shall submit an Intent to Claim, in writing, to the AUTHORITY within the next 14 days.
- 15.1.4 If the CONTRACTOR believes additional compensation or time is warranted, then he must immediately begin keeping complete, accurate, and specific daily records concerning every detail of the potential claim including actual costs incurred. The

CONTRACTOR shall provide the AUTHORITY access to any such records and furnish the AUTHORITY copies, if requested. Equipment costs must be based on the CONTRACTOR's internal rates for ownership, depreciation, and operating expenses and not on published rental rates. In computing damages, or costs claimed for a change order, or for any other claim against the Authority for additional time, compensation or both, the contractor must prove actual damages based on internal costs for equipment, labor or efficiencies. Total cost, modified total cost or jury verdict forms of presentation of damage claims are not permissible to show damages. Labor inefficiencies must be shown to actually have occurred and can be proven solely based on job records. Theoretical studies are not a permissible means of showing labor inefficiencies. Home office overhead will not be allowed as a component of any claim against the Authority.

- 15.1.5 If the claim or dispute is not resolved by the Project Manager, then the CONTRACTOR shall submit a written Claim to the Contracting Officer within 90 days after the CONTRACTOR becomes aware of the basis of the claim or should have known the basis of the claim, whichever is earlier. The Contracting Officer will issue written acknowledge of the receipt of the Claim.
- 15.1.6 The CONTRACTOR waives any right to claim if the AUTHORITY was not notified properly or afforded the opportunity to inspect conditions or monitor actual costs or if the Claim is not filed on the date required.

## **15.2 Presenting the Claim**

- 15.2.1 The Claim must include all of the following:
  - a. The act, event, or condition the claim is based on
  - b. The Contract provisions which apply to the claim and provide relief
  - c. The item or items of Contract work affected and how they are affected
  - d. The specific relief requested, including Contract Time if applicable, and the basis upon which it was calculated
  - e. A statement certifying that the claim is made in good faith, that the supporting cost and pricing data are accurate and complete to the best of your knowledge and belief, and that the amount requested accurately reflects the Contract adjustment which the CONTRACTOR believes is due.

## **15.3 Claim Validity, Additional Information, and AUTHORITY's Action**

- 15.3.1 The Claim, in order to be valid, must not only show that the CONTRACTOR suffered damages or delay but that it was caused by the act, event, or condition complained of and that the Contract provides entitlement to relief for such act, event, or condition.
- 15.3.2 The AUTHORITY can make written request to the CONTRACTOR at any time for additional information relative to the Claim. The CONTRACTOR shall provide the AUTHORITY the additional information within 30 days of receipt of such a request. Failure to furnish the additional information may be regarded as a waiver of the Claim.

## **15.4 Contracting Officer's Decision**

- 15.4.1 The CONTRACTOR will be furnished the Contracting Officer's Decision within 90 days, unless the Contracting Officer requests additional information or gives the CONTRACTOR notice that the time for issuing a decision is being extended for a specified period. The Contracting Officer's decision is final and conclusive unless,

within 14 days of receipt of the decision, the CONTRACTOR delivers a Notice of Appeal to the Executive Director of the Authority.

### **15.5 Appeals on a Contract Claim.**

15.5.1 An appeal from a decision of the Contracting Officer on a contract claim may be filed by the CONTRACTOR with the Executive Director of the Authority. The appeal shall be filed within 14 days after the decision is received by the CONTRACTOR. An appeal by the CONTRACTOR may not raise any new factual issues or theories of recovery that were not presented to and decided by the Contracting Officer in the decision under Section 15.4, except that a CONTRACTOR may increase the contractor's calculation of damages if the increase arises out of the same operative facts on which the original claim was based. The CONTRACTOR shall file a copy of the appeal with the Contracting Officer.

- a. An appeal must contain a copy of the decision being appealed and identification of the factual or legal errors in the decision that form the basis for the appeal.
- b. The Executive Director shall handle the appeal of a claim under this section expeditiously.

### **15.6 Construction Contract Claim Appeals.**

**15.6.1 The appeal from a decision of the Contracting Officer of a claim involving a construction contract shall be resolved by:**

- a. binding and final arbitration under AS 09.43.010 - 09.43.180 (Uniform Arbitration Act) if the claim is:
  1. less than \$250,000 and the CONTRACTOR requests arbitration of the claim; or
  2. \$250,000 or more and both the agency and the CONTRACTOR agree to arbitration of the claim; or
- b. a hearing under the Authority's established policy and procedures if the claim is not handled by arbitration under 15.6.1 of this subsection.

### **15.7 Fraud and Misrepresentation in Making Claims**

Criminal and Civil penalties authorized under State or federal law (including, but not limited to, forfeiture of all claimed amounts) may be imposed on the CONTRACTOR if the CONTRACTOR makes or uses a misrepresentation in support of a claim or defraud or attempt to defraud the AUTHORITY at any stage of prosecuting a claim under this Contract.”

This page is blank intentionally.

## SECTION 00 80 00 SUPPLEMENTARY CONDITIONS

### MODIFICATIONS TO THE GENERAL CONDITIONS 00 70 00

The following supplements modify, change, delete from, or add to Section 00 70 00 "General Conditions of the Construction Contract for Buildings", revised December, 2011. Where any article of the General Conditions is modified, or a Paragraph, Subparagraph, or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause shall remain in effect.

#### **SC-1-DEFINITIONS**

A. Add the following definitions:

1. **QUALITY ASSURANCE ACCEPTANCE TESTING** – This is all sampling and testing performed by the CONTRACTOR to determine at what level the product or service will be accepted for payment. Qualified personnel and laboratories will perform sampling and testing. The AUTHORITY pays for this testing.
2. **QUALITY CONTROL PROGRAM (QC PROGRAM)** – The CONTRACTOR'S, Subcontractor's or Supplier's operational techniques and activities that maintain control of the manufacturing process to fulfill the Contract requirements. This may include materials handling, construction procedures, calibration and maintenance of equipment, production process control, material sampling, testing and inspection, and data analysis.
3. **RESIDENT ENGINEER** - The Engineer's authorized representative assigned to make detailed observations relating to contract performance.

#### **SC-2.4-VISITS TO SITE/PLACE OF BUSINESS**

At General Conditions Article 2.4, delete the first four words of the first sentence ("The Contracting Officer will ...") and replace with the following words "The Contracting Officer has the right to, but is not obligated to..."

#### **SC-4.3-EXPLORATIONS AND REPORTS**

At General Conditions Article 4.3, add the following paragraph:

"All reports and other records (if available) are provided for informational purposes only to all plan holders listed with the AUTHORITY as General Contractors, and are available to other planholders upon request. They are made available so Bidders have access to the same information available to the AUTHORITY. The reports and other records are not intended as a substitute for independent investigation, interpretation, or judgment of the Bidder. The AUTHORITY is not responsible for any interpretation or conclusion drawn from its records by the Bidder. While referenced by or provided with the Contract Documents; the recommendations, engineering details, and other information contained in these reports of explorations shall not be construed to supersede or constitute conditions of the Contract Documents."

**PROJECT NO. 22021**

**NIKOLAI AND VENETIE POWER SYSTEM AND BULK FUEL UPGRADE PROJECTS**

**SC-4.7 – SURVEY CONTROL**

At General Conditions Article 4.7, delete the section in its entirety. See Section 01 71 23.16 - Construction Surveying for project specific surveying requirements.

**SC-5.4.3 – INSURANCE REQUIREMENTS**

At General Condition Article 5.4.3 add the following:

- "d. The delivery to the AUTHORITY of a written notice in accordance with the policy provisions is required before cancellation of any coverage or reduction in any limits of liability."

**SC-5.4.2a – WORKERS COMPENSATION INSURANCE**

At General Condition Article 5.4.2a, delete paragraph "a" in its entirety and replace with the following:

- "a. Workers' Compensation Insurance: The Contractor shall provide and maintain, for all employees of the Contractor engaged in work under this contract, Workers' Compensation Insurance as required by AS 23.30.045. The Contractor shall be responsible for Workers' Compensation Insurance for any subcontractor who provides services under this contract. Coverage shall include:
  1. Waiver of subrogation against the Authority.
  2. Employer's Liability Protection in the amount of \$500,000 each accident / \$500,000 each disease.
  3. If the Contractor directly utilizes labor outside of the State of Alaska in the prosecution of the work, "Other States" endorsement shall be required as a condition of the contract.
  4. Whenever the work involves activity on or about navigable waters, the Workers' Compensation policy shall contain a United States Longshoreman's and Harbor Worker's Act endorsement, and when appropriate, a Maritime Employer's Liability (Jones Act) endorsement with a minimum limit of \$1,000,000."

**SC-5.4.2 b- COMMERCIAL GENERAL LIABILITY INSURANCE**

At General Conditions Article 5.4.2.b, remove and replace the last sentence with the following:

"The following parties shall be named as "Additional Insured" under all liability coverages listed above:

The Authority  
The Denali Commission

**SC-5.4.2d- BUILDER'S RISK INSURANCE**

At General Conditions Article 5.4.2.d, delete the subsection in its entirety.

**PROJECT NO. 22021**

**NIKOLAI AND VENETIE POWER SYSTEM AND BULK FUEL UPGRADE PROJECTS**

**SC – 6.13 – SUBCONTRACTORS**

Add new general conditions Article 6.13.7 as follows:

6.13.7 The Contractor may, without penalty, replace a subcontractor who:

1. Fails to comply with the licensing and registration requirements as AS 08.18;
2. Fails to obtain or maintain a valid Alaska Business License;
3. Files for bankruptcy or becomes insolvent;
4. Fails to execute a subcontract or performance of the work for which the subcontractor was listed, and the Contractor has acted in good faith;
5. Fails to obtain bonding acceptable to the AUTHORITY;
6. Fails to obtain insurance acceptable to the AUTHORITY;
7. Fails to perform subcontract work for which the subcontractor was listed;
8. Must be replaced to meet the Contractor's required state or federal affirmative action requirements.
9. Refuses to agree to abide by the Contractor's labor agreement; or
10. Is determined by the AUTHORITY to be not responsible.

In addition to the circumstances described above, a Contractor may in writing request permission from the AUTHORITY to add a new subcontractor or replace a listed subcontractor. The AUTHORITY will approve the request if it determines in writing that allowing the addition or replacement is in the best interest of the AUTHORITY.

The Contractor shall submit a written request to add a new Subcontractor or replace a listed Subcontractor to the Contracting Officer a minimum of five working days prior to the date the new Subcontractor is scheduled to be work on the construction site. The request must state the basis for the request and include supporting documentation acceptable to the Contracting Officer.

If a Contractor violates this article, the Contracting Officer may;

1. Cancel the Contract after Award without any damages accruing to the AUTHORITY; or
2. After notice and hearing, assess a penalty on the bidder in an amount not exceeding 0 percent of the value of the subcontract at issue.

**SC-7.14 – WAGES AND HOURS OF LABOR**

General Condition Article 7.14.1 and Article 7.14.3 shall apply to all on-site work in Nikolai. This is because the City of Nikolai is a political subdivision of the State of Alaska and this work is subject to AS 36.05.

General Condition Article 7.14.1 and Article 7.14.3 shall not apply to work in Venetie. This is because the Venetie Village Council is not a political subdivision of the State of Alaska and this work is not subject to AS 36.05.

General Condition Article 7.14.2 (Alaska Mini-Davis-Bacon Wage Rates) shall apply to all on site work in both Nikolai and Venetie. Applicable wage rates can be obtained at:

<https://labor.alaska.gov/lss/pamp600.htm>

**SC-9.4–CHANGE ORDER**

At General Conditions Article 9.4, add the following sentence:

**PROJECT NO. 22021**

**NIKOLAI AND VENETIE POWER SYSTEM AND BULK FUEL UPGRADE PROJECTS**

"The AUTHORITY will issue Change Orders for the CONTRACTOR to sign. A Change Order shall be considered executed when the AUTHORITY signs it. The CONTRACTOR'S signature indicates that they accept the Change Order or acknowledge it. Acknowledgement of a Change Order does not surrender the CONTRACTOR'S right to claim."

**SC-11.3 – COMPUTATION OF CONTRACT TIME**

At General Conditions Article 11.3.3, delete the subsection in its entirety.

**SC – 11.5 – EXTENSION DUE TO DELAYS:**

At General Conditions Article 11.5, delete paragraph in its entirety and replace with the following:

The right of the CONTRACTOR to proceed shall not be terminated nor the CONTRACTOR charged with liquidated or actual damages because of delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to the following: acts of God or of the public enemy, acts of the AUTHORITY in its contractual capacity, acts of another contractor in the performance of a contract with the AUTHORITY, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, acts or restraints of governmental authorities affecting the project or directly or indirectly prohibiting or restricting the furnishing or use of materials or labor required; inability to secure materials, machinery, equipment or labor because of priority, allocation or other regulations of any governmental authorities, and delays of Subcontractors or Suppliers due to such causes. Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension, provided that the CONTRACTOR shall within twenty four (24) hours from the beginning of any such delay (unless the Contracting Officer shall grant a further period of the time prior to the date of final settlement of the Contract), notify the Project Manager in writing of the cause of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

**SC-11.8–DELAY DAMAGES**

At General Condition Article 11.8, add the following paragraphs:

11.8.1 For each calendar day that the Work is not Substantially Complete after the Substantial Completion date has passed, the AUTHORITY shall deduct \$500 from progress payments up to a maximum of \$10,000 (20 days). The daily and maximum charges shall apply individually and equally to Bid Item 1 (Nikolai Power) and Bid Item 2 (Venetie Power) according to their respective Substantial Completion dates. The daily and maximum charges shall not apply to Bid Item 3 (Venetie Bulk Fuel).

11.8.2 If no money is due the CONTRACTOR, the AUTHORITY shall have the right to recover these sums from the CONTRACTOR, from the Surety, or from both. These are liquidated damages and not penalties. These charges shall reimburse the AUTHORITY for its additional administrative expenses incurred due to CONTRACTOR'S failure to complete the work within the time specified.

11.8.3 Permitting the CONTRACTOR to continue and finish the work or any part of it after the Contract time has elapsed or the completion date has passed does not waive the AUTHORITY'S rights to collect liquidated damages under this section.

**PROJECT NO. 22021**

**NIKOLAI AND VENETIE POWER SYSTEM AND BULK FUEL UPGRADE PROJECTS**

**SC-12.1–WARRANTY AND GUARANTEE**

At General Condition Article 12.1, add the following sentence:

“The failure of the AUTHORITY to strictly enforce the Contract in one or more instances does not waive its right to do so in other or future instances.”

**SC-12.6–CORRECTION OR REMOVAL OF DEFECTIVE WORK**

At General Condition Article 12.6, add the following paragraphs:

“The CONTRACTOR shall establish necessary lines and grades before performing the Work. Work done before necessary lines and grades are established, Work contrary to the AUTHORITY’S instructions, Work done beyond the limits of the Contract, or any extra Work done without authority, will be considered as unauthorized and shall not be paid for by the AUTHORITY, and may be ordered removed or replaced at no additional cost to the AUTHORITY.”

**SC – 13.5 – STORED MATERIALS AND EQUIPMENT**

At General Conditions Article 13.5, add the following;

“No payment will be made for an individual/unique item of material or equipment with a total value less than \$25,000 per item or for any item of material or equipment scheduled for incorporation into the work in less than 60 days from its arrival on site.”

**MODIFICATIONS TO THE FEDERAL ASSURANCES 00 90 00**

The following supplements modify, change, delete from, or add to Section 00 90 00 "Federal Assurances". Where any Paragraph, Subparagraph, or Clause of the Federal Assurances is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Paragraph, Subparagraph, or Clause shall remain in effect.

**SC-90.1–BREACHES AND DISPUTE RESOLUTION**

At Federal Assurances Paragraph 90.1 delete the paragraph in its entirety. See General Conditions 00 70 00 Article 15 for Claims and Disputes

**SC-90.2 – TERMINATION**

At Federal Assurances Paragraph 90.2 delete the paragraph in its entirety. See General Conditions 00 70 00 Article 14 for Suspension of Work and Termination.

**SC-90.4–DAVIS-BACON ACT, AS AMENDED**

At Federal Assurances Paragraph 90.4 delete the paragraph in its entirety. See Supplemental Conditions 00 80 00 SC-7.14 for prevailing wage rate requirements.

**END OF SECTION 00 80 00**

Because this contract is funded with federal funds, the following contract provisions shall apply, where applicable, to all work performed on the contract by the contractor's own organization and by subcontractors. As provided in this Section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions and further require their inclusion in any lower tier subcontracts or purchase orders that may in turn be made. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all applicable Required Contract Provisions.

### 90.1 BREACHES AND DISPUTE RESOLUTION.

**Contracts in excess of \$250,000.** Any dispute arising under this Contract which is not disposed of by mutual agreement shall be resolved in accordance with 2 AAC 108.915.

### 90.2 TERMINATION.

**Contracts in excess of \$10,000.** This Contract may be terminated by either party upon 10 days written notice if the other party fails substantially to perform in accordance with its terms through no fault of the party initiating the termination ("Default Termination"). If the Authority terminates this agreement, the Authority will pay the Contractor a sum equal to the percentage of Work completed that can be substantiated either by the Contractor to the satisfaction of the Authority, or by the Authority. If the Authority becomes aware of any non-conformance with the Work or this agreement by the Contractor, the Authority will promptly notify the Contractor in writing of the non-conformance. Should the Contractor's Work remain in non-conformance after having received written notification, the percentage of total compensation attributable to the non-conforming Work may be withheld. The Authority may at any time suspend or terminate ("Convenience Termination") this Agreement for its needs or convenience with or without cause upon written notice. In the event of a Convenience Termination, the Contractor will be compensated for all authorized Work and authorized expenditures performed to the date of receipt of written notice of termination plus reasonable expenses. No fee or other compensation will be due for any incomplete portion of the Work.

### 90.3 EQUAL EMPLOYMENT OPPORTUNITY.

Except as otherwise provided under [41 CFR Part 60](#), **all construction contracts** must include, and all contractors and subcontractors must comply with, the equal opportunity clause provided under [41 CFR 60-1.4\(b\)](#), in accordance with Executive Order 11246, "Equal Employment Opportunity" ([30 FR 12319, 12935, 3 CFR Part, 1964-1965](#) Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at [41 CFR part 60](#), "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

### 90.4 DAVIS-BACON ACT, AS AMENDED ([40 U.S.C. 3141-3148](#)).

**Construction contracts in excess of \$2,000** are required to comply with the Davis-Bacon Act ([40 U.S.C. 3141-3144](#), and [3146-3148](#)) as supplemented by Department of Labor regulations ([29 CFR Part 5](#), "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must pay wages not less than once a week. **A copy of the current prevailing wage determination issued by the Department of Labor is included in this solicitation.** Contract and subcontract awards must be conditioned upon the acceptance of the wage determination. All suspected or reported violations must be reported to the Federal awarding agency.

### 90.5 COPELAND “ANTI-KICKBACK” ACT ([40 U.S.C. 3145](#))

**Construction contracts in excess of \$2,000** are required to comply with the Copeland “Anti-Kickback” Act ([40 U.S.C. 3145](#)), as supplemented by Department of Labor regulations ([29 CFR Part 3](#), “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). Each contractor or subrecipient is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. All suspected or reported violations must be reported to the Federal awarding agency.

### 90.6 CONTRACT WORK HOURS/SAFETY STANDARDS ACT ([40 U.S.C. 3701-3708](#)).

**Construction contracts in excess of \$100,000** that involve the employment of mechanics or laborers are required to comply with [40 U.S.C. 3702](#) and [3704](#), as supplemented by Department of Labor regulations ([29 CFR Part 5](#)). Under [40 U.S.C. 3702](#) of the Act, each contractor is required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of [40 U.S.C. 3704](#) are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

### 90.7 RIGHTS TO INVENTIONS MADE UNDER A CONTRACT OR AGREEMENT.

If the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” the recipient or subrecipient must comply with the requirements of [37 CFR Part 401](#), “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

### 90.8 CLEAN AIR ACT ([42 U.S.C. 7401-7671Q](#).) AND THE FEDERAL WATER POLLUTION CONTROL ACT ([33 U.S.C. 1251-1387](#)), AS AMENDED

**Contracts in excess of \$150,000** are required to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act ([42 U.S.C. 7401-7671q](#)) and the Federal Water Pollution Control Act as amended ([33 U.S.C. 1251-1387](#)). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

### 90.9 DEBARMENT AND SUSPENSION (EXECUTIVE ORDERS 12549 & 12689)

A contract award **greater than or equal to \$25,000** (see [2 CFR 180.220](#)) must not be made to parties listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at [2 CFR 180](#) that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” **Contractors that apply or bid for an award exceeding \$25,000 must sign and submit the attached “Debarment” certification with their bid.**

### 90.10 BYRD ANTI-LOBBYING AMENDMENT ([31 U.S.C. 1352](#))

Each contractor and subcontractor must certify that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or

employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by [31 U.S.C. 1352](#). Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Disclosures shall be forwarded from tier to tier up to the Authority. **Contractors that apply or bid for an award exceeding \$100,000 must sign and submit the attached “Lobbying” certification with their bid.**

### 90.11 PROCUREMENT OF RECOVERED MATERIALS.

A state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at [40 CFR part 247](#) that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, **where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000**; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

### 90.12 PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT.

Contractors and subcontractors are prohibited from entering into a contract (or extending or renewing a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in [Public Law 115-232](#), section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). See [§ 200.216](#).

### 90.13 DOMESTIC PREFERENCES FOR PROCUREMENTS.

As appropriate and to the extent consistent with law, and to the greatest extent practicable, Contractor’s are required to provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all contracts and purchase orders for work or products under this award. See [§ 200.322](#).

**DEBARMENT, SUSPENSION, INELIGIBILITY & VOLUNTARY EXCLUSION – 2 CFR 200.214; Executive Orders 12549 and 12689** [Applicable to all federally assisted contracts which exceed \$25,000]**Instructions for Certification:**

1. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective contractor and lower tier participants knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Authority may pursue available remedies, including suspension and/or debarment.
2. The prospective contractor and lower tier participants shall provide immediate written notice to the Authority if at any time the prospective contractor and lower tier participants learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
3. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "persons," "lower tier covered transaction," "principal," "proposal," and voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Orders [12549](#) and 12689. You may contact the Authority for assistance in obtaining a copy of those regulations.
4. The prospective contractor and lower tier participants agrees by submitting this bid or proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized in writing by the Authority.
5. The prospective contractor and lower tier participants further agrees by submitting this bid or proposal that it will require the language of this certification be included in all subcontracts and all lower tier participants shall certify compliance with this requirement.
6. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Non-procurement List issued by U.S. General Service Administration.
7. Nothing contained in the foregoing shall be construed to require establishment of system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
8. Except for transactions authorized under Paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to all remedies available to the Federal Government, the Authority may pursue available remedies including suspension and/or debarment.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transaction**

- (1) The prospective contractor and lower tier participants certifies, by submission of this bid or proposal, that neither it nor its "principals" is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) When the prospective contractor and lower tier participants is unable to certify to the statements in this certification, such prospective participant shall attach an explanation to this proposal.

The Contractor, \_\_\_\_\_ certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 2 CFR §180 apply to this certification and disclosure, if any.

**Signature of Contractor's Authorized Official:**

\_\_\_\_\_

**Name and Title of Contractor's Authorized Official:**

\_\_\_\_\_

**Date:** \_\_\_\_\_

**CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING - 31 USC §1352**

[Applicable to all federally assisted contracts and to all related subcontracts which exceed \$100,000]

A bidder must submit to the Authority the below certification with its bid response for any federally assisted contract that exceeds \$100,000. Bids that are not accompanied by a completed certification may be rejected as nonresponsive.

1. The undersigned Contractor certifies, to the best of his or her knowledge and belief, that:
  - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
  - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and **submit Standard Form-LLL, "Disclosure Form to Report Lobbying,"** in accordance with its instructions.
2. The undersigned also agrees that he or she shall require that the language of this certification be **included in all lower tier subcontracts, which exceed \$100,000** and that all such recipients shall certify and disclose accordingly.
3. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 USC 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor, \_\_\_\_\_ certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 USC 3801, *et seq.*, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official: \_\_\_\_\_

Name and Title of Contractor's Authorized Official: \_\_\_\_\_

Date: \_\_\_\_\_

End of Federal Assurances

**SECTION 01 11 13**  
**SUMMARY OF WORK**

**PART 1 – GENERAL**

**1.1 REQUIREMENTS INCLUDED**

- A. Contract Method.
- B. Work by Others.
- C. Coordination.
- D. Work covered by Contract Documents.

**1.2 RELATED REQUIREMENTS:**

- A. Section 00 70 00 – General Conditions.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Division 1
- D. Divisions 2 through 33

**1.3 CONTRACT METHOD**

- A. This Contract is lump sum as shown on the Section 00 32 00 – Bid Schedule. This work shall be measured and paid for in accordance with Section 00 70 00 – General Conditions, Article 13 – Payment to Contractors and Completion and Section 01 29 73 - Schedule of Values.

**1.4 WORK BY OTHERS**

- A. All work shall be included in this Contract except for tasks specifically indicated as being performed by others.

**1.5 COORDINATION**

- A. Coordinate Work to assure efficient and orderly sequence of installation.
- B. Prior to procurement, verify that characteristics of interrelated equipment are compatible.
- C. Coordinate space requirements and installation of components. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.

**1.6 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The intent of the Contract is to provide for the construction and completion of every detail of work described in the Contract Documents. The Contractor shall furnish all labor, materials, supervision, equipment, tools, transportation, quality control, and supplies required to complete the work in accordance with the Contract Documents.
- B. The following general requirements apply to the Base Bid and to all Additive Alternates.
  - 1. Mobilize all required materials, equipment, tools, supplies, etc. and all required

personnel to the project sites in Nikolai, AK and Venetie, AK.

2. Obtain written agreement to procure local fill to use for Classified Fill and Bedding Material.
  3. Locate existing survey control, locate existing utilities, and lay out work areas.
  4. Provide advance written notice to the Authority in accordance with Section 01 77 00 - Contract Closeout Procedures to schedule substantial completion inspection. Prior to declaring the project substantially complete, perform all required tests of mechanical and electrical systems and flush and charge all piping systems. Document completion by filling out the Pre-Commissioning Substantial Completion Inspection Checklist and submitting to the Authority. Note that a draft version of a typical power plant checklist is included at the end of this section. Final checklists for each system will be provided to the Contractor prior to the start of construction.
  5. Provide access for the Authority and the Engineer to the site. Provide on-site transportation, ladders, lifts, etc. for inspection and testing of the work.
  6. Correct all deficiencies noted in the Substantial Completion Inspection punchlist. Provide photographic documentation of corrections to the Authority.
  7. Upon completion remove all Contractor tools and equipment from the project site, thoroughly clean all work areas, remove all rubbish and debris, and dispose of all waste in accordance with the Contract Documents.
- C. Work under this Contract is defined under Base Bid and Additive Alternates as described in the paragraphs that follow.

#### **1.7 NIKOLAI POWER SYSTEM UPGRADE BASE BID DESCRIPTION OF WORK**

Provide all work on the Nikolai Power System Upgrade project except for work specifically indicated on the Drawings as Additive Alternates. Work shall include but not be limited to:

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Provide temporary fuel system for existing power generator and maintain fuel supply to the existing power plant.
- C. Prepare the site including all clearing, grubbing and utility demolition.
- D. Procure local fill material, place, screen, compact and grade.
- E. Provide geotextile fabric, geomembrane liner, rigid insulation, and other materials as specified, etc.
- F. Provide trenching, backfill, compaction, warning tape, etc.
- G. Provide fencing and other features.
- H. Provide concrete foundations and slabs.
- I. Provide power plant building including steel floor, framing, siding, roofing, paint, insulation, doors, windows, stairs, landings, etc.

- J. Provide generation equipment, controls, mechanical equipment, piping, electrical equipment, wiring, raceways, lighting, instrumentation, fire suppression, and all other materials as required to provide a complete, fully functional power plant.
- K. Provide power plant fuel system including tanks, pumps, piping, appurtenances, equipment, and associated electrical power and controls.
- L. Provide materials and equipment to modify existing bulk fuel storage facility to serve new power plant fuel system including new pump, piping, appurtenances, equipment, and associated electrical power and controls. Turn over all captured fuel to the City.
- M. Provide step up transformer, ground sleeve, grounding grid, and associated electrical system.
- N. Provide electrical distribution work specifically indicated on the Drawings as Base Bid.
- O. Provide permanent telephone and internet service to the new power plant.
- P. Upon substantial completion acceptance, the Authority will functionally test and commission the system. The Contractor shall support the Authority during testing. Support shall include but not limited to:
  - 1. Provide a minimum 100kW portable load bank with all required cables and connectors connected to the switchgear feeder breaker and a 120VAC control power source.
  - 2. Provide technicians on site who are familiar with the mechanical and electrical systems to assist with testing and to make corrections to any deficiencies found in the Work.
- Q. Tasks performed by the Authority will include but not be limited to:
  - 1. A complete functional test of the generation system including automatic and manual start/stop, paralleling, load sharing, and safety shut downs.
  - 2. Functional test of all associated systems including fuel, used oil blending, cooling, heat recovery, plant heat, and ventilation.
  - 3. Final verification of calibration of all mechanical and electrical instrumentation devices.
  - 4. Test of all data and communication systems to demonstrate proper operation of SCADA system including remote internet access.
  - 5. Demonstration of system functions and operations to local power plant operators.
- R. Upon completion of testing and commissioning the Contractor shall:
  - 1. De-energize the old power plant and provide new overhead electrical service to the old power plant building.
  - 2. Finish grade the project site and all work areas.

**1.8 NIKOLAI POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #1 (HEAT RECOVERY) DESCRIPTION OF WORK**

- A. Perform all heat recovery work specifically indicated on the Drawings as Additive Alternate #1.
- B. Provide all materials and equipment required for the heat recovery system to the school and community building. Materials shall include but not be limited to: arctic pipe, piping, valves, pumps, equipment, appurtenances, instrumentation, control panels, energy meter, and associated electrical system.
- C. Provide trenching, backfill, compaction, warning tape, and insulation.
- D. Install all mechanical and electrical systems.
- E. Pressure test, flush, and charge all piping systems.
- F. Test all electrical and controls systems.
- G. Finish grade the project site and all work areas.

**1.9 NIKOLAI POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #2  
(ELECTRICAL DISTRIBUTION) DESCRIPTION OF WORK**

- A. Perform all electrical distribution work specifically indicated on the Drawings as Additive Alternate #2.
- B. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- C. Provide new underground electrical distribution.
- D. Provide trenching, backfill, compaction, and warning tape.
- E. Make repairs to existing overhead electrical distribution.

**1.10 NIKOLAI POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #3 (AIRPLANE FUEL) DESCRIPTION OF WORK**

- A. Perform all fuel system work specifically indicated on the Drawings as Additive Alternate #3.
- B. Provide all materials and equipment required for the new pipelines to the airport.

**1.11 NIKOLAI POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #4 (BARGE PIPELINES) DESCRIPTION OF WORK**

- A. Perform all fuel system demolition and decommissioning work specifically indicated on the Drawings as Additive Alternate #4.
- B. Turn over all captured fuel to the City.

**1.12 VENETIE POWER SYSTEM UPGRADE BASE BID DESCRIPTION OF WORK**

Provide all work on the Venetie Power System Upgrade project except for electrical distribution work described below and specifically indicated on the Drawings as Additive Alternates. Work shall include but not be limited to:

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Demolish portions of existing overhead electrical distribution and install portions

- of new overhead electrical distribution in the vicinity of the power plant to create a clear open work area and to allow connection of new power plant to existing overhead electrical distribution.
- C. Provide new pole and install demolished (3) 25 KVA transformers on new pole. Install new overhead secondary service to the Central Sanitation Facility, existing Washeteria, and existing Shed.
  - D. Re-route and reinstall new backup overhead secondary service to the Central Sanitation Facility.
  - E. Prepare the site including all clearing, grubbing and utility demolition.
  - F. Provide geotextile fabric, geomembrane liner, rigid insulation, etc.
  - G. Provide trenching, backfill, compaction, warning tape, etc.
  - H. Provide fencing and other features.
  - I. Provide concrete foundations and slabs.
  - J. Provide power plant building including steel floor, framing, siding, roofing, paint, insulation, doors, windows, stairs, landings, etc.
  - K. Provide generation equipment, controls, mechanical equipment, piping, electrical equipment, wiring, raceways, lighting, instrumentation, fire suppression, and all other materials as required to provide a complete, fully functional power plant.
  - L. Provide power plant fuel system including tanks, pumps, piping, appurtenances, equipment, and associated electrical power and controls.
  - M. Provide grounding grid and associated electrical system.
  - N. Provide step up transformer, underground primary and secondary feeders poles, overhead primary, and connections to the existing overhead distribution system.
  - O. Provide new services to the new bulk fuel and dispensing sites and other electrical distribution work specifically indicated on the Drawings as Base Bid.
  - P. Provide permanent telephone and internet service to the new power plant.
  - Q. Upon substantial completion acceptance, the Authority will functionally test and commission the system. The Contractor shall support the Authority during testing. Support shall include but not limited to:
    - 1. Provide a minimum 100kW portable load bank with all required cables and connectors connected to the switchgear feeder breaker and a 120VAC control power source.
    - 2. Provide technicians on site who are familiar with the mechanical and electrical systems to assist with testing and to make corrections to any deficiencies found in the Work
  - R. Tasks performed by the Authority will include but not be limited to:
    - 1. A complete functional test of the generation system including automatic and manual start/stop, paralleling, load sharing, and safety shut downs.

2. Functional test of all associated systems including fuel, used oil blending, cooling, heat recovery, plant heat, and ventilation.
  3. Final verification of calibration of all mechanical and electrical instrumentation devices.
  4. Test of all data and communication systems to demonstrate proper operation of SCADA system including remote internet access.
  5. Demonstration of system functions and operations to local power plant operators.
- S. Upon completion of testing and commissioning the Contractor shall:
1. De-energize the old power plant and provide new at-grade electrical service to the old power plant building.
  2. Demolish the old step-up transformer bank and associated secondary feeder.
  3. Finish grade the project site and all work areas.

**1.13 VENETIE POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #1  
(ELECTRICAL DISTRIBUTION) DESCRIPTION OF WORK**

- A. Perform all electrical distribution work specifically indicated on the Drawings as Additive Alternate #1.
- B. Maintain primary power in the community with limited outages scheduled in advance with the local utility.
- C. Provide new overhead electrical distribution to the southeast of the new power plant.

**1.14 VENETIE POWER SYSTEM UPGRADE ADDITIVE ALTERNATE #2  
(ELECTRICAL DISTRIBUTION) DESCRIPTION OF WORK**

- A. Perform all electrical distribution work specifically indicated on the Drawings as Additive Alternate #2.
- B. Maintain primary power in the community with limited outages scheduled in advance with the local utility.
- C. Provide new overhead electrical distribution to the northwest of the new power plant.

**1.15 VENETIE BULK FUEL AND DISPENSING SYSTEM UPGRADES BASE BID  
DESCRIPTION OF WORK**

Provide all work on the Venetie Bulk Fuel Upgrade Project. Work shall include but not be limited to:

- A. Perform all site preparation associated with the fuel system improvements including all clearing, grubbing, waste disposal, removal/relocation of materials at the sites that would interfere with construction, removal of construction debris, dewatering, surface preparation, stockpiling, excavation, and erosion control.
- B. Provide all geotextile, rigid board insulation, and membrane liner material, and all mining manufacture, processing, procurement, transportation, placement, compaction and finish grading of classified and unclassified fill as required to

- construct foundation pads and access drives for the tank farm, bulk transfer, and dispensing facilities.
- C. Provide all gradation and compaction testing.
  - D. If contaminated soil is encountered during the project provide all necessary PPE for worker safety. Segregate and stockpile any contaminated soil encountered that is above ADEC action limits in accordance with the specifications. Contractor shall stockpile up to 1000 CY of contaminated soil at no additional cost to the project.
  - E. Construct lined earthen secondary containment system: Provide all geotextile and membrane liner, drainage piping and sumps, stairways and platforms, and procure, transport, place, compact and finish grade classified fill as required to construct a fully functional lined earthen secondary containment system.
  - F. Provide single wall, horizontal, skid mounted aboveground storage and protected dispensing tanks with all required venting, gauging, water draw, pressure relief, and other appurtenances.
  - G. Provide all tank concrete foundation systems.
  - H. Provide fence, gates, and traffic protection devices.
  - I. Provide truck fill secondary containment area including all weldments, coating systems, etc.
  - J. Provide bulk fuel storage, transfer, and dispensing related mechanical and electrical systems including all pump enclosures, cabinets, pumps, meters, dispensers, hose reels, piping, valves, fittings, filters, tags, and related appurtenances.
  - K. Provide all lighting, grounding/bonding systems, and electrical and mechanical systems and controls, fire extinguishers, signs and placards, and other components as required to provide complete, fully functional bulk fuel storage, transfer and dispensing facilities in accordance with the Contract Drawings and Specifications
  - L. Decommission existing tanks: Activities to complete this task shall include visual inspection, filtering (particulate and water removal) and transferring all useable product from the tanks to be decommissioned to the appropriate new tanks, removing, filtering, and properly disposing of any accumulated oily water in the tanks, transfer of any accumulated sludge into 55-gallon steel barrels, cleaning the inside of the tanks, proper disposal of all rinsate, sludge, and other waste materials generated during cleaning of the tanks, disconnecting and blanking off all piping connected to the tanks to be decommissioned, closing all penetrations with the exception of a vent, relocating the tanks to owner approved, in-town location, and posting a sign on each tank stating that the tank is permanently closed and noting the date of closure in accordance with the Contract Drawings and Specifications.

- M. Backfill decommissioned tank farm secondary containment area with classified fill.
- N. Decommission existing Above Grade Piping: Activities to complete this task include disconnecting piping from all tanks and appliances, purging piping and properly disposing of all liquids and sludges, cutting of all piping into maximum 10 ft lengths and transporting the cut pieces to an existing community landfill (if approved by local solid waste authority) or to an alternative, Authority approved, offsite disposal area in accordance with the Contract Drawings and Specifications.
- O. Maintain sufficient bulk fuel storage and retail dispensing facilities throughout construction to meet community demands: Contractor shall provide temporary fuel storage and retail dispensing facilities until the new Tank Farm and dispensing facilities are fully operational. Contractor shall operate temporary tank farm and dispensing facilities and work with the Village of Venetie to ensure that the power plant, local residents, and retail fuel sale customers are adequately served throughout the project.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION**

### **3.1 PROJECT SCHEDULE CRITICAL DATES**

Pre-Bid Meeting	See 001150a Special Notice to Bidders
Bid Opening	See 000200 Invitation to Bid
Nikolai Power Substantial Completion	December 1, 2022
Nikolai Power Final Completion	January 17, 2023
Note: Nikolai Power completion dates include Base Bid and all Additive Alternates.	
Venetie Power Base Bid Substantial Completion	January 31, 2023
Venetie Power Base Bid Final Completion	February 28, 2023
Venetie Power Add Alt #1 & #2 Substantial Completion	September 20, 2023
Venetie Power Add Alt #1 & #2 Final Completion	October 18, 2023
Venetie Bulk Fuel Substantial Completion	October 4, 2022
Venetie Bulk Fuel Final Completion	November 1, 2022

**END OF SECTION**

**NIKOLAI POWER PLANT - DRAFT  
PRE-TESTING SUBSTANTIAL COMPLETION INSPECTION CHECKLIST**

<b>Building &amp; Site</b>	
Site Grading Complete Including Drainage & Compaction	
Site Cleanup Complete	
Fence Complete, Gate Swings & Latches Operational	
Footings & Shim Plates Complete, Level, Nuts Tight	
Stairs/Landings In Place & Anchored	
Exterior Steel Coatings & Touch Up Complete (Cold Galv)	
Site Signs and Placards In Place	
Roofing / Siding / Trim Complete	
Doors, Closures, Latches, Panic Hardware, Etc. Operational	
Door Stops Positioned Correctly & Secured	
Door Thresholds Caulked Liquid Tight	
Door Weatherstrips In Place & Aligned	
Control Room Windows & Trim Complete & Caulked	
<b>Intermediate Fuel Tank &amp; Piping</b>	
Footings Level, Anchor Bolts Tight	
Appurtenances Installed & Setup/Calibrated	
Piping, Wiring/Conduit, Supports, Complete & Secure	
No Leaks or Drips - Pipe Flanges, Valves	
Pipe Painting Complete	
Verify Actuator Valve & Float Switch Operation	
4'-0" Minimum Fuel Level in Intermediate Tank For Commissioning	
Evo Level Probe Installation Complete	
Evo Level and Temperature Readings Correct on Day Tank Panel	
<b>Plant Exterior Wiring &amp; Feeder</b>	
Ground Grid Complete, Building, Intermediate Tank, & Fence Bonded	
Exterior Alarms, Lighting, Recepts, Etc. Complete & Operational	
Exterior Radiator Power/Control Wiring Complete & Operational	
Intermediate Tank Wiring Complete	
Phone/Internet Service Installed and Operational for Commissioning	
480V Feeder Complete & Sealed	
Step Up Transformer Installation Complete, Neutral & Ground Bonded	
Primary Feeder Backfill, Grading, & Site Cleanup Complete	
Sectionalizing Cabinet & Riser Complete, Phases Labeled	

**NIKOLAI POWER PLANT - DRAFT**  
**PRE-TESTING SUBSTANTIAL COMPLETION INSPECTION CHECKLIST**

<b>Generators</b>	<b>Gen #1</b>	<b>Gen #2</b>	<b>Gen #3</b>
Control Wires Labeled, Terminations Tight, No Wear Points			
Power Wires Phase Taped, Lugs Tight, No Wear Points			
Bushings Grounded on Main Power Wireway & Enclosures			
Liquid Tight Flex Ends Made Up Tight			
Generator Grounded to Structure			
24VDC Starter Wires Color Code, Routing & Support, Lugs Tight			
Oil Level Site Gauge & Level Switch Adjusted & Marked			
Aeroquip Hose & Wire Loom Installation - No Wear Points			
Coolant Hose Secure, No Sharp Cut Ends, Clamps Tight			
Battery Charger Operation - Normal & Equalize			
No Leaks - Glycol, Fuel, & Oil			
Exhaust Flanges Tight			
Exhaust Pipe & Muffler Complete & Supports Tight			
Exhaust Thimbles Complete & Sealed			
Exhaust Pipe Insulation Installed			
Crank Vent Condensate Trap & Pipe Complete & Secure			
<b>Switchgear Generator Sections</b>	<b>Gen #1</b>	<b>Gen #2</b>	<b>Gen #3</b>
Power Wires Phase Taped, Lugs Tight			
Control Wires Labeled, Terminations Tight			
Verify 24VDC Engine Battery Power			
<b>Switchgear Master &amp; Feeder/VFD Sections</b>			
Power Wires Phase Taped, Lugs Tight			
Control Wires Labeled, Terminations Tight			
Turn Off AC Power and Verify 24VDC Engine Power			
Ground Bus Permanently Bonded to Floor			
Ground Bus TEMPORARILY Bonded to Neutral for Load Bank Test			
Feeder Breaker Connected & Rotation Correct			
<b>Station Service &amp; Control Wiring</b>			
Raceway Supports Complete & Secure			
Conduit & Flex Compression Fittings Tight			
Blank Cover Plates Installed			
Instrument Cables Secured			
Cat6a Cables in Separate Raceways			
Fire System Cables in Separate Raceways - Red			
Bushings Grounded on Main Power Conduits			
Station Service Neutral Grounded at Dry Pack Transformer Only			
Panelboard Circuits Correct, Phase Colors Correct			
Light Switching (nightlight & switched)			
Emergency Light Operation (turn off breakers)			
All Devices Labeled With Circuit #			
All Disconnects Labeled With Device Served			

**NIKOLAI POWER PLANT - DRAFT  
PRE-TESTING SUBSTANTIAL COMPLETION INSPECTION CHECKLIST**

<b>Plant Heating &amp; Ventilation</b>	
CUH-1 & P-HR1 Operation Verified	
EF-1 & EF-2 Installations Complete & Rotation Correct	
Exhaust Hood Installation Complete and Sealed	
Intake Duct, Grille, Dampers, & Filters Installation Complete and Sealed	
EF-1 & EF-2 Thermostat - Fan & Damper Operation	
EF-1 & EF-2 Intake Damper Operation	
Combustion Air Intake Damper Operation (turn off breaker)	
<b>Generator Cooling Piping System</b>	
Provide Copies of Piping Pressure Test Reports	
Cooling Piping Flushed & Witch Hat Strainers Removed	
Cooling Piping Charged With Ethylene Glycol & Bled	
Radiators & Structural Support Complete & Secure	
Radiators Exterior Piping Complete & Painted	
Radiators Rotation Correct in VFD & Bypass	
Interior Piping Circuiting & Valves Correct	
Interior Piping Supports Complete & Secure	
Interior Piping Insulation Complete, Color Coded Flow Arrows Correct	
Numbered Valve Tags Correct, Small NO & NC Valve Tags In Place	
ET-1 Low Level Switch Installation Correct - Check Function	
ET-1 Level Sensor Probe Function, Correct Reading at Switchgear	
Instrumentation Complete and Calibrated	
Glycol Storage Tank Filled & Excess In Sealed Marked Drums - Pink	
<b>Heat Recovery System at Plant</b>	
Provide Copies of Piping Pressure Test Reports Including Arctic Pipe	
Interior Heat Recovery Piping Flushed and Drained	
All HR Piping Including Arctic Pipe Charged With Propylene Glycol & Bled	
Heat Recovery Piping Circuiting & Valves Correct	
Heat Recovery Piping & Equipment Supports Complete & Secure	
Interior Piping Insulation Complete, Color Coded Flow Arrows Correct	
Numbered Valve Tags Correct, Small NO & NC Valve Tags In Place	
P-HR1A & P-HR1B On/Off Operation, Flow Correct	
Flow Meter Remote Head Installed In Accessible Location	
Flow Meter Operation Verified	
Instrumentation Complete and Calibrated	
Arctic Pipe Wall Penetrations Complete & Sealed	
Excess Propylene Glycol In Sealed Marked Drums - Orange	

**NIKOLAI POWER PLANT - DRAFT  
PRE-TESTING SUBSTANTIAL COMPLETION INSPECTION CHECKLIST**

<b>Interior Fuel &amp; Oil Piping</b>	
Provide Copies of Piping Pressure Test Reports	
Piping Circuiting & Valves Correct	
Piping & Equipment Supports Complete & Secure	
Piping Painted, Color Coded Flow Arrows Correct	
Numbered Valve Tags Correct, Small NO & NC Valve Tags In Place	
System Flooded With No Leaks - Pipe Fittings, Hose Ends, Valves	
Day Tank Filled for Commissioning	
Exterior Fill & Vent Pipes Complete, Supports Secure, & Wall Pen. Sealed	
<b>Day Tank &amp; Blender</b>	
Day Tank Float Switches All N.C. Verify Start, Stop, Low Alarm, & High Alarm	
Pump Rotations Correct	
Verify N.O. & N.C. Solenoid Operation	
Set Timers to 5 Sec & Verify, Then Set to Design Values	
Blender Hopper Low Float Switch Correct (N.O.), Verify Enable, Disable	
Verify Filter #1 & #2 Differential Pressure Switch Settings At 7 PSI	
Day Tank Full of Fuel for Commissioning	
10 Gallons Fuel in Used Oil Hopper for Commissioning	
Used Oil Filters Filled With Fuel	
EVO Programmed With Tank Level and Temperature Readings Correct	
<b>Tank Farm Revisions for Intermediate Tank Fill</b>	
Pump, Actuator Valve, Filter, & Piping Complete	
Pipe Painted, Valve Tag & Filter Decal Installed	
Piping & Equipment Supports Complete & Secure	
Conduit Routing Correct (Outside Classified) & Supports Complete	
Existing Panel Modifications Correct	
New Panel Installation Complete, Function Verified	
<b>Heat Recovery Arctic Pipe &amp; End User Buildings</b>	
Arctic Pipe Backfill, Grading, & Site Cleanup Complete	
End User Building Entrances Complete	
Wall Penetrations Flashed & Sealed	
End User Building Piping Circuiting & Valves Correct	
End User Building Piping Supports Complete & Secure	
Interior Piping Insulation Complete, Color Coded Flow Arrows Correct	
Numbered Valve Tags Correct, Small NO & NC Valve Tags In Place	
Pump On/Off Operation, Speed & Flow Correct	
HR Panel Installed and Correct Function Verified	
Energy Meter Installed and Calibrated	
Instrumentation Complete and Calibrated	

**NIKOLAI POWER PLANT - DRAFT  
PRE-TESTING SUBSTANTIAL COMPLETION INSPECTION CHECKLIST**

<b>Fire Suppression System (may need to be completed after plant commissioning)</b>	
Storage Tank & Rack Installations Complete & Secure	
Tubing Support Complete & Secure	
Panel & Manual Pull Station Installation	
Detector Installation	
Alarm Horn Installation	
Full Nitrogen Bottle In Rack	
Full Spare Nitrogen Bottle On Site	
System Filled With Potable Water	
Fire Suppression System Field Recertified	
On Site Training Performed	
<b>Nikolai Power Plant Substantial Completion Acceptance - Ready for Testing</b>	
Engineer Signature, Printed Name, & Date	
Contractor Signature, Printed Name, & Date	
AEA Staff Signature, Printed Name, & Date	

## **SECTION 01 12 19**

### **CONTRACTOR'S CERTIFICATION OF SUBCONTRACTS**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

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

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 10 00 – Information to Bidders.
- B. Section 00 43 00 – Subcontractor List.
- C. Section 00 70 00 – General Conditions: Subcontractor Certification and Approval.
- D. Section 00 80 00 – Supplementary Conditions: Subcontract Provisions.
- E. Section 01 33 00 – Submittal Procedures.

##### **1.3 PREPARATION OF CERTIFICATION**

- A. Certification Forms: Use forms provided by the Authority.
- B. Contractor shall prepare certification form. Where required, attach additional information to the certification form.
- C. Substitute certification forms will not be considered.

##### **1.4 SUBMITTAL OF CERTIFICATION**

- A. The Contractor shall submit certification forms for all subcontractors for review and approval by the Authority.

##### **1.5 CONSIDERATION OF CERTIFICATION**

- A. Following receipt of submitted subcontractor certification forms, the Authority will review for the following, at minimum:
  - 1. Completeness of forms and attachments
  - 2. Proper execution (signatures) of forms and attachments
- B. Incomplete or improperly executed subcontractor certification forms will be returned to the Contractor for revision and resubmittal.

- C. Contractor shall remove its subcontractor from the project site until its subcontractor certification form is submitted, reviewed, and approved.
- D. The Authority will not process payments for work performed by a non-certified subcontractor.

**1.6 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 Project Manager's signature.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**



**Note: The Contractor shall provide this form for ALL subcontractors working on this project.** This form is applicable to all projects, including Small Procurement Contracts, and must be completed in full.

PROJECT: Nikolai & Venetie Power System & Bulk Fuel Upgrade Projects PROJ. #: \_\_\_\_\_

PRIME CONTRACTOR: \_\_\_\_\_

Pursuant to the Contract Documents, we hereby stipulate the following concerning the award of Work to the last Subcontractor on the following list:

1. First Tier Subcontractor: \_\_\_\_\_ DBE? Yes  No   
 Second Tier: \_\_\_\_\_ DBE? Yes  No   
 Third Tier: \_\_\_\_\_ DBE? Yes  No   
 Fourth Tier: \_\_\_\_\_ DBE? Yes  No
2. Date of Subcontract: \_\_\_\_\_
3. Amount of Subcontract: \$ \_\_\_\_\_
4. Scope of Work: \_\_\_\_\_  
 \_\_\_\_\_
5. Are the following documents kept on file by both the Contractor and the Subcontractor (check the appropriate answer)?  
 Contract Minimum Wage Schedule Yes  No
6. Does the Subcontract contain provisions for prompt payment, release of retainage, and interest on late payment and retainage conforming to AS 36.90.210?  
 Yes  No
7. Does the Subcontract specifically bind the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the Authority and does it contain waiver provisions and termination provisions as required by the Contract Documents?  
 Yes  No
8. a. Does the Subcontractor have adequate insurance coverages as specified in the Contract Documents?  
 Yes  No   
 If not, does the Contractor stipulate that the insurance limits of the Subcontractor are acceptable to the Contractor and that he has notified his insurance carrier of the reduced insurance limits?  
 Yes  No
- b. Does the evidence of insurance certify that the policies described thereon comply with all aspects of the insurance requirements for this project?  
 Yes  No

**PROJECT:** Nikolai & Venetie Power System and Bulk Fuel Upgrade Projects **PROJ. #:** \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

c. Does the evidence of insurance list the Authority as an "Additional Insured" or "Certificate Holder"?

Yes  No

d. Does the evidence of insurance commit to providing 30 day written notice of cancellation or reduction of any coverage?

Yes  No

e. Insurance Expiration dates:

Comprehensive or Commercial General Liability: \_\_\_\_\_

Automobile: \_\_\_\_\_ Workers' Compensation: \_\_\_\_\_

(Other): \_\_\_\_\_

9. Copies of the following professional certifications, licenses, and registrations are attached (circle all that apply):

Business License (mandatory)

Contractor License (mandatory)

Land Surveyor's License

Electrical Administrator's License (mandatory for electrical subs)

Mechanical Administrator's License (mandatory for mechanical subs)

Engineer/Architect

Other: \_\_\_\_\_

10. Exceptions to any of the above are explained as follows: \_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATION (to be completed and signed by PRIME CONTRACTOR):** I certify all the above to be true and correct.

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Company: \_\_\_\_\_

Date: \_\_\_\_\_

-----  
**AUTHORITY'S APPROVAL/DISAPPROVAL**

The subject subcontract is **APPROVED**. Nothing in this approval should be construed as relieving the Prime Contractor of the responsibility for complete performance of the work or as a waiver of any right of the Approval to reject defective work.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Manager

The subject subcontract is **NOT APPROVED** for the following reasons:

\_\_\_\_\_  
\_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Manager

**SECTION 01 26 63**  
**CHANGE PROCEDURES**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Section 00 32 00 – Bid Schedule.
- B. Section 00 51 00 – Construction Contract.
- C. Section 00 70 00 – General Conditions.
- D. Section 00 80 00 – Supplementary Conditions.
- E. Section 01 29 73 – Schedule of Values.
- F. Section 01 29 76 – Application for Payment.
- G. Section 01 32 16 – Construction Progress Schedule.
- H. Section 01 73 00 – Execution Requirements.

**1.2 SUBMITTALS**

- A. Submit the name of the individual authorized to accept changes, and to be responsible for informing others in the Contractor's employ of changes in the Work.
- B. Submit with each price proposal a complete, detailed, itemized cost breakdown defining all impacts on Contract Price and Contract Time, in sufficient detail to fully explain the basis for the proposal.
- C. All change forms shall be provided by the Authority.

**1.3 CHANGE AUTHORIZATION**

- A. In accordance with Section 00 70 00 – General Conditions, Article 9 Changes, the Authority may authorize changes to the Work. The Authority may authorize changes in one of the following ways:
  - 1. Directive (Section 00 70 00, Article 9.3).
  - 2. Change Order (CO) (Section 00 70 00, Article 9.4).
  - 3. Acceptance of Shop Drawing variations, which have been identified by the Contractor. (Section 00 70 00, Article 9.5).

4. Interim Work Authorization (IWA) (Section 00 70 00, Article 9.10).

#### 1.4 CHANGE PROCEDURES

- A. The Authority may initiate change to the contract by issuing to the Contractor a Request for Proposal (RFP) document. The RFP may include:
  1. Change narrative.
  2. Supplementary revised drawings, specifications, additional details, or sketches.
  3. Other information as deemed appropriate.
- B. The Contractor shall request a change to the contract by submitting to the Authority a written Change Order Request form provided by the Authority. The Authority may respond by rejecting it, or with an RFP to initiate contract change. The Contractor's Change Order Request shall include, at minimum:
  1. A description of the proposed change with a statement of the justification of the change.
  2. Statement of the effect of the change on Contract Price and Contract Time.
  3. The information required in Section 00 70 00 – General Conditions, Article 15 Claims and Disputes.
- C. Upon receipt of a Request for Proposal (RFP) from the Authority, the Contractor shall respond with a price proposal. The Contractor shall make every effort to return its price proposal in response to the RFP within the time frame requested by the Authority, but in no event later than 14 calendar days from date the RFP is issued. For work to be performed after the execution of a Change Order, the basis of pricing shall be estimated. For work performed prior to the execution of a Change Order, the pricing shall be based upon documentation of actual incurred costs. The price proposal shall include:
  1. A complete, detailed, itemized price breakdown.
  2. For the prime contractor and subcontractors, detailed documentation of costs for direct costs, labor, equipment, consultants, sub-contractor markups, overhead and profit, and other items set forth in General Conditions Section 00 70 00, Article 10.
  3. Other information as required by the Authority.
- D. Upon receipt of pricing response to an RFP, the Authority may execute a change to the contract. The issuance of an RFP or the receipt of pricing response to an RFP shall not obligate the Authority to execute a change to the contract.

## **1.5 DIRECTIVES**

- A. The Authority may issue Directives as per Section 00 70 00 – General Conditions, Article 9.3.

## **1.6 INTERIM WORK AUTHORIZATIONS (IWA)**

- A. The Authority may issue Interim Work Authorizations in accordance with Section 00 70 00 – General Conditions, Article 9.10.

## **1.7 CHANGE ORDER**

- A. Any change in Contract Time, Contract Price, or associated responsibility within the general scope of the Contract, shall be made by Change Order.
- B. The Contractor shall use forms furnished by the Authority for Change Orders.

## **1.8 CHANGE PRICING AND TIME ANALYSIS**

- A. Unless specified elsewhere, Section 00 70 00 – General Conditions, Article 10 shall be applied to the negotiation of all changes to the scope of the contract.
  - 1. Unit Price, when unit prices are contained in the Contract.
  - 2. Mutually acceptable Lump Sum Price, including overhead and profit.
  - 3. Cost of the Work.
- B. UNIT PRICE CHANGE – For unit price CHANGE PROCEDURES, prices shall be determined by multiplying the contractual unit price(s) by the estimated quantities of Work associated with changed scope. Payment will be based on the actual installed quantities. Document actual installed quantities and submit information requested by the Authority on a daily basis for its approval and certification. Refer to Section 00 70 00 – General Conditions, Article 10 for additional requirements.
- C. LUMP SUM PRICE CHANGE – The Contractor and the Authority shall negotiate an equitable price (and time adjustment if appropriate) in good faith. If negotiations do not result in a mutually acceptable lump sum price, the Authority may, at its discretion, direct the Contractor to perform the work under Cost of the Work Change Order.
- D. COST OF THE WORK CHANGE – The Contractor shall document Cost of the Work on forms acceptable to the Authority, and shall submit documented costs to the Authority daily for verification and certification. Cost of the Work pricing proposals shall be supported by invoices for substantiation of purchase and rental costs and with additional data as may be requested by Authority.

- E. Time Analysis: NOT USED.
- F. The Authority shall have the right to audit all records in possession of the Contractor relating to activities covered by the Contractor's pricing of Contract CHANGE ORDER PROCEDURES, including Cost of the Work pricing, as set forth in Section 00 70 00 – General Conditions. If the Contractor is a joint venture, the right of Authority shall apply collaterally to the same extent to the records of joint venture sponsor, and of each individual joint venture member.

## **1.9 FORM EXECUTION**

- A. Contract forms issued under this section shall be effective the date the Authority's authorized person signs the form.
- B. For Change Orders, Contractor signature will indicate acceptance of the terms or acknowledgment of order, depending on box checked. Acknowledgment of Change Order does not substitute for notification requirements of Section 00 70 00 – General Conditions, Article 15.1.

## **1.10 PAYMENT**

- A. The Contractor shall promptly revise its Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item. For Change Orders, adjust the Contract Price as shown on the Change Order.
- B. The Contractor shall promptly revise and resubmit its progress schedules to reflect any change in Contract Time, including adjustments for other items of Work affected by the change.
- C. Payment for contract changes shall be made only following the execution of Change Orders and the inclusion of the Change Order by reference on the Application for Payment form.
- D. Payment shall not be made for Work authorized via Interim Work Authorization until such work is formalized in a Change Order.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**



# REQUEST FOR INFORMATION or INTERPRETATION

Project: Nikolai and Venetie Power System  
& Bulk Fuel Upgrade Projects

R.F.I. Number:  
From: \_\_\_\_\_

Date: \_\_\_\_\_

To: Alaska Energy Authority

A/E Project Number: \_\_\_\_\_

Contract For: \_\_\_\_\_

Re:

Specification Section:	Paragraph:	Drawing Reference:	Detail:
_____	_____	_____	_____

Request:

Signed by:

Date:

Response:

Attachments:

Response From:	To:	Date Rec'd:
_____	_____	_____

Signed by:

Date:

Copies:  Owner  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File



# CHANGE ORDER REQUEST (PROPOSAL)

Project: Nikolai and Venetie Power System

Change Order Request Number: \_\_\_\_\_

& Bulk Fuel Upgrade Projects

From (Contractor): \_\_\_\_\_

To: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_

A/E Project Number: \_\_\_\_\_

Re: \_\_\_\_\_

Contract For: \_\_\_\_\_

This Change Order Request (C.O.R.) contains an itemized quotation for changes in the Contract Sum or Contract Time in response to proposed modifications to the Contract Documents based on Proposal Request No. \_\_\_\_\_.

Description of Proposed Change:

Attached supporting information from:  Subcontractor  Supplier  \_\_\_\_\_  \_\_\_\_\_

Reason For Change:

Does Proposed Change involve a change in Contract Sum?  No  Yes [Increase] [Decrease] \$ \_\_\_\_\_  
Does Proposed Change involve a change in Contract Time?  No  Yes [Increase] [Decrease] \_\_\_\_\_ days.

Attached pages:  Proposal Worksheet Summary: \_\_\_\_\_  
 Proposal Worksheet Detail(s): \_\_\_\_\_

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Copies:  Owner  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File

This page is blank intentionally.

---

Project No.: \_\_\_\_\_

Directive No.: 000

Project Name: Nikolai and Venetie Power System  
& Bulk Fuel Upgrade Projects

Scope of this Directive	
<input type="checkbox"/>	Commencement of Work
<input type="checkbox"/>	Suspension of Work
<input type="checkbox"/>	Contract Non-Conformance
<input type="checkbox"/>	Contract Clarification

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Directive issued By: \_\_\_\_\_ Date: \_\_\_\_\_  
Engineer or AEA Project Manager

Receipt Acknowledged By: \_\_\_\_\_ Date: \_\_\_\_\_  
Contractor's Representative:

This Directive complements, and is used in accordance with the terms and provisions of the above referenced Contract, and shall not serve to authorize a change in Contractual responsibility. If the CONTRACTOR believes that any condition in this document may affect Contract Time, Price, or Requirement the CONTRACTOR shall immediately notify the DEPARTMENT of such condition. Contract Performance is required as follows:

## DESCRIPTION

X

If the Contractor believes this Directive will adjust the Contract time or price the Contractor shall provide a Changer Order Request (COR) to the Authority, within 14 calendar days.

**SECTION 01 29 73**  
**SCHEDULE OF VALUES**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Requirements for preparing and submitting the schedule of values.

**1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 26 63 – Change Procedures.
- D. Section 01 29 76 – Application for Payment.
- E. Section 01 32 16 – Construction Progress Schedule.
- F. Section 01 33 00 – Submittal Procedures.
- G. Section 01 77 00 – Contract Closeout Procedures.

**1.3 FORMAT**

- A. Form and content must be acceptable to the Authority.
- B. Form shall have a signature block for submission by Contractor and a signature block for approval by the Authority.
- C. Content shall include the following column headings.
  - 1. Pay Item Activity Number.
  - 2. Pay Item Activity Description.
  - 3. Pay Item Activity Dollar Value.
  - 4. Current Percent Complete.
  - 5. Current Dollar Complete.
  - 6. Previous Percent Complete.
  - 7. Previous Dollar Complete.

- 8. Percent Complete this Period.
- 9. Dollar Complete this Period.

**1.4 CONTENT**

- A. List installed value of each activity shown on the submitted and approved Construction Project Schedule.
- B. For items on which payments will be requested for stored products, list sub values for cost of stored products with taxes paid.
- C. Limits for specific line item values shall be as specified below and shall be included on all approved Schedules of Values and Applications for Payment.

- 1. Mobilization and Demobilization: NOT APPLICABLE
- 2. Contract Closeout Procedures: Unless specified elsewhere, the assigned values for tasks specified under Contract Closeout Procedures shall be based upon the estimated value of each task. The breakdown shall include separate amounts for the requirements of Final Completion and Final Acceptance, as set forth below:

<u>Contract Price</u>	<u>Value for Final Completion</u>	<u>Value for Final Acceptance</u>
Less than \$200,000	\$2,000	\$2,000
\$200,000 - \$500,000	\$5,000	\$5,000
\$500,001 - \$1,000,000	\$10,000	\$10,000
\$1,000,001 - \$5,000,000	\$20,000	\$20,000
Greater than \$5,000,000	\$30,000	\$30,000

- D. The sum of values listed on the Schedule of Values shall equal total Contract Price.

**1.5** A Schedule of Values containing costs for early activities in excess of actual value (“front end loading”) will be rejected by the Authority until the Contractor corrects the deficiency. The Authority shall not be obligated to pay the Contractor until front end loading is eliminated and the Schedule of Values is approved.

**1.6 SUBMITTAL**

- A. Submit proposed Schedule of Values with updated Construction Project Schedule per specification sections for Summary of Work, Construction Progress Schedule, and Submittals.
- B. Submit Schedule of Values with updated completion percentages sufficiently in advance of each Application for Payment to enable the Authority to resolve differences.

**1.7 SUBSTANTIATING DATA**

- A. When the 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 01 29 76**

### **APPLICATION FOR PAYMENT**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

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

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 32 00 – Bid Schedule.
- B. Section 00 70 00 – General Conditions.
- C. Section 00 80 00 – Supplementary Conditions.
- D. Section 01 11 13 – Summary of Work.
- E. Section 01 26 63 – Change Procedures.
- F. Section 01 29 73 – Schedule of Values.
- G. Section 01 32 16 - Construction Progress Schedule
- H. Section 01 77 00 – Contract Closeout Procedures.

##### **1.3 FORMAT**

- A. Submit Application for Payment on form approved by the Authority.

##### **1.4 PREPARATION OF APPLICATIONS**

- A. Type required information on Application for Payment form acceptable to the Authority.
- B. Execute certification by original signature of authorized officer upon each copy of the Application for Payment.
- C. Show breakdown of costs for each item of the Work on accepted Schedule of Values as specified in Section 01 29 73 – Schedule of Values.
- D. 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.

- E. Submit Stored Materials Worksheet with every Application for Payment requesting payment for stored materials. Show only direct costs of materials and freight. Submit documentation in accordance with Section 00 70 00 – General Conditions, Article 13.5 Stored Materials and Equipment, for materials shown in column titled “New Material This Pay Request Period.”

## **1.5 SUBMITTAL PROCEDURES**

- A. Submit two originals of each Application for Payment at one-month intervals, or as otherwise agreed upon. Each document shall bear original signature of authorized executive.
- B. Submit with Authority-approved transmittal letter bearing Authority’s project number.

## **1.6 SUBSTANTIATING DATA**

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

## **1.7 SUBMITTALS WITH APPLICATION FOR PAYMENT**

- A. Submit the following for review sufficiently in advance of Application for Payment to allow detailed review by Authority and resolution of differences.
  - 1. Schedule of Values with updated percentages of completion as required by Section 01 29 73 – Schedule of Values.
- B. Submit the following with each Application for Payment.
  - 1. Updated construction schedule as required by Section 01 32 16 - Construction Progress Schedule.
  - 2. Updated Project Record Documents as required by Section 01 78 39 – Project Record Documents.
  - 3. Letter certifying that all Project Record Documents, including as-built drawings and submittals are current.

## **1.8 ADDITIONAL REQUIREMENTS FOR FIRST APPLICATION FOR PAYMENT**

- A. The first Application for Payment will be processed after the Project Manager has received all of the following:

1. Superintendent Data (Section 00 70 00 – General Conditions, Article 6.2).
2. Progress Schedule (Section 00 70 00 – General Conditions, Paragraph 6.6.1, and Section 01 32 16 - Construction Progress Schedule).
3. Schedule of Values (Section 00 70 00 – General Conditions, Paragraph 6.6.2, and Section 01 29 73 – Schedule of Values).
4. Submittal Schedule (Section 00 70 00 – General Conditions, Paragraph 6.6.2).
5. Safety Representative Designation (Section 00 70 00 – General Conditions, Article 6.18).
6. Building Permits (Section 00 70 00 – General Conditions, Article 7.2).
7. Name of Individual Authorized to Accept Changes (Section 01 26 63 – Change Procedures).
8. Contractor Quality Control Plan (Section 01 45 00 – Quality Control).
9. Freeze Protection Plan (Section 01 51 00 – Construction Facilities).

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 31 19**  
**PROJECT MEETINGS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Requirements for various meetings during the construction project.

**1.2 RELATED REQUIREMENTS**

- A. Section 01 11 13 – Summary of Work.
- B. Section 01 32 16 - Construction Progress Schedule.
- C. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- D. Section 01 45 00 – Quality Control.
- E. Section 01 73 00 – Execution Requirements.

**1.3 GENERAL REQUIREMENTS**

- A. All project meetings will be conducted telephonically unless specifically arranged to be held in person.

**1.4 PRECONSTRUCTION CONFERENCES**

- B. The Authority will administer preconstruction conference for execution of Contract and exchange of preliminary submittals. Attendance by all key Contractor and Subcontractor personnel is required.
- C. The Authority will document the meeting and distribute minutes within 48-hours of adjournment. Minutes will be typed, reflecting date, list of attendees and in a format to facilitate correction of previous meeting minutes. Distribution will be to all attendees and those affected by discussions or decisions made at meeting.

**1.5 PREINSTALLATION CONFERENCES**

- A. When required in an individual Specification section, and as shown in the Contractor's quality control plan, or as directed by the Authority, convene a pre-installation conference prior to commencing Work for a specific item.
- 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.

- D. Record significant discussions and agreements and disagreements of each conference, and approved schedule. Distribute record of conference to all attendees within 24-hours of adjournment.

### **1.6 PROGRESS MEETINGS**

- A. The Contractor shall attend Progress Meetings when scheduled by the Project Manager or requested by the Contractor. Progress Meetings will be held on a day and time which is mutually convenient to both the Authority and the Contractor. These meetings shall be documented by the Contractor as well as the Project Manager.
- B. The minimum frequency will be typically one time per week during active construction.
- C. Progress Meeting shall be attended by all key Contractor personnel and, as appropriate, key Subcontractor personnel.
- D. The Contractor shall furnish copies of its updated schedule, per Section 01 32 16 - Construction Progress Schedule, to all attendees of the meeting. This schedule will be reviewed in detail during the meeting and will be used for the coordination of activities by others.
- E. Progress Meetings will also be used to review other key aspects of the Work, such as safety, quality, critical items, etc.

### **1.7 SAFETY MEETING**

- A. The Contractor shall conduct Safety Meetings as required by its project Safety Program. Safety Meetings shall be documented in the daily work report.
- B. The Contractor shall invite the Authority to attend Safety Meetings.

### **1.8 OTHER MEETINGS**

- A. At various times throughout the duration of the Contract, the Contractor will be required to attend meetings as requested by the Authority. It is anticipated that such meetings will involve coordination with others, project schedule review, problem resolution, change order negotiations, and other topics of mutual importance.

### **PART 2 – PRODUCTS (NOT USED)**

### **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 32 16**

**CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

**1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Section 01 11 13 – Summary of Work.
- D. Section 01 26 63 – Change Procedures.
- E. Section 01 29 73 – Schedule of Values.
- F. Section 01 29 76 – Application for Payment.
- G. Section 01 31 19 – Project Meetings.
- H. Section 01 32 26 - Construction Progress Reporting.
- I. Section 01 33 00 – Submittal Procedures.

**1.3 SUBMITTALS**

- A. Within fifteen (15) days after date established in Notice to Proceed, submit preliminary schedule.
- B. Within ten (10) days after joint review, submit complete schedule.
- C. Submit updated schedule with each Application for Payment.

**1.4 SCHEDULE FORMAT**

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches.
- C. Scale and Spacing: To allow for notations and revisions.

**PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION**

### **3.1 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

### **3.2 CONTENT**

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by Specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.

### **3.3 BAR CHARTS**

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

### **3.4 REVIEW AND EVALUATION OF SCHEDULE**

- A. Participate in joint review and evaluation of schedule with Project Manager at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

### **3.5 UPDATING SCHEDULE**

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Indicate changes required to maintain Date of Substantial Completion.

### **3.6 DISTRIBUTION OF SCHEDULE**

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Engineer, Authority, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

**END OF SECTION**

**SECTION 01 32 26**  
**CONSTRUCTION PROGRESS REPORTING**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Requirements for submitting reports documenting construction progress.

**1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Section 01 11 13 – Summary of Work.
- D. Section 01 31 19 – Project Meetings.
- E. Section 01 32 16 - Construction Progress Schedule.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION**

**3.1 SCHEDULE**

- A. A daily work report shall be prepared and submitted by the site Superintendent recording progress, all pertinent daily events, and status of any ongoing issues.
- B. Reports shall be submitted a minimum of one time per week. All daily reports for the week shall be consolidated and submitted no later than noon on the following Monday.
- C. More frequent submission may be required during critical times with multiple time critical tasks.
- D. Daily reports documenting work that will be concealed shall be submitted prior to covering work. Types of work requiring immediate reporting shall include but not be limited to underground installation, work that will be enclosed within building walls, floors, or roofs, and coating systems requiring multiple coats.
- E. Daily reports documenting mandatory tests shall be submitted within 24 hours of test completion. Types of work requiring immediate reporting shall include but not be limited to piping pressure tests and electrical circuit tests.

**3.2 CONTENT**

Daily reports shall include the following as appropriate:

- A. Summary of general tasks relative to construction progress.
- B. Weather conditions.
- C. A minimum of 4 project photos of the work performed that day unless no new work

was performed.

- D. Additional photos shall be submitted as required to document work that will be covered or to document mandatory tests.
- E. Additional photos shall be submitted if problematic site conditions are encountered that may result in delays or change of conditions.
- F. Names and titles of all laborers onsite (daily basis).
- G. Regular labor hours worked (daily basis).
- H. Overtime hours worked (as encountered and cumulative).
- I. Material quantities delivered (daily and cumulative).
- J. General material management items (daily and cumulative).
- K. Unsuitable quantities hauled offsite (daily and cumulative).
- L. Quantities of pay items installed (daily and cumulative).
- M. Any construction issues resulting in delays (reported day of, as encountered).
- N. Any equipment issues causing delays (reported day of, as encountered).
- O. Safety Meetings, topics covered.
- P. Safety issues and concerns (reported day of, as encountered).
- Q. Disputes (reported day of, as encountered).
- R. Any information required or outstanding from the Authority.
- S. Items that could require a change order (reported day of, as encountered).
- T. Requests for information (reported day of, as encountered).
- U. Site characteristics that may warrant a Change In Conditions (reported day of, as encountered).
- V. Note of any onsite conversation, or communication, where direction is given to the contractor which could incur an added cost owed to the Contractor. Date, Time and name of individual must be reported (reported day of, as encountered).

### **3.3 DISTRIBUTION OF REPORTS**

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Engineer, Authority, and other concerned parties.

**END OF SECTION**

## **SECTION 01 33 00**

### **SUBMITTAL PROCEDURES**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Procedures for the preparation, tracking, and review of submittals for the project.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Requirements.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Section 01 11 13 – Summary of Work.
- D. Section 01 12 19 – Contractor’s Certification of Subcontracts.
- E. Section 01 29 73 – Schedule of Values.
- F. Section 01 29 76 – Application for Payment.
- G. Section 01 32 16 - Construction Progress Schedule.
- H. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- I. Section 01 45 00 – Quality Control.
- J. Section 01 60 00 – Material and Equipment.
- K. Section 01 73 00 – Execution Requirements.
- L. Section 01 77 00 – Contract Closeout Procedures.
- M. Technical Specifications.
- N. Operations and Maintenance Manuals.
- O. Equipment Installation Data.

##### **1.3 SUBMITTAL REGISTER**

- A. Submit preliminary Submittal Register as required by Section 00 70 00 – General Conditions. In addition to manufacturer’s data and shop drawing submissions, include all submittals required by the Contract Documents in the Submittal Register.

- B. Submittal Register shall portray an orderly sequence of submittals, early submittals for long lead-time items, and submittals which require extensive review.
- C. Preliminary Submittal Register shall be provided to the Authority within 7 calendar days of the contract award.
- D. Submittal Register shall be reviewed by the Authority and shall be revised and resubmitted until accepted by the Authority.

#### **1.4 SUBMITTAL PREPARATION**

- A. The Contractor shall prepare all submittals as required by the provisions of Section 00 70 00 – General Conditions, Section 00 80 00 – Supplementary Conditions, the technical specifications, and the drawings.
- B. The Contractor shall review submittals for accuracy and completeness prior to submitting.
- C. All Submittals shall be provided to the Authority within 28 calendar days of the contract award.

#### **1.5 SUBMITTAL REQUIREMENTS**

- A. Unless otherwise directed in these documents or by Authority, provide each submittal as an electronic portable document format (PDF) file, transmitted via email. If file is too large to be received by Authority via email, provide a download link, deliver in portable USB drive, or as otherwise instructed by Authority.
- B. Submit each submittal with a Submittal Summary form as its face document. Use a Submittal Summary form provided by the Authority, or a substitute approved by the Authority.
- C. Label submittals with a numbering system approved by the Authority. Identify the project by title and Authority's project number; identify Work and product by Specification section and Article number.
- D. Submit items required by individual Specification sections together. Do not mix items specified in different sections in the same submittal. Sequence the submission of submittals to correspond with the approved Submittal Register.
- E. Before the submission of each submittal, the Contractor shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the Work and the Contract Documents, upon which the Contractor shall certify in writing on each submittal that it has made this

determination. The failure to review and certify a submittal shall be cause for the Authority to return the submittal without review.

- F. On the submittal, notify the Authority in writing of any deviations from requirements of the Contract Documents.
- G. Organize the submittals into logical groupings to facilitate the processing of related submittals, such as:
  - 1. By Specification Section number. Sequentially number each submittal. Resubmittals shall be identified with the original submittal number followed by a sequential alphabetic suffix.
  - 2. Finishes which involve Authority selection of colors, textures, or patterns.
  - 3. Items required by the individual Technical Product Specification Sections.
  - 4. Associated items, which require correlation for efficient function or for installation.
- H. Submit all required color and finish samples in order to receive approval for colors and finishes.

## **1.6 RESUBMITTALS**

- A. Provide complete copies of re-submittals. Do not re-submit partial copies of submittals for incorporation into the Authority's retained submittals from the prior submission.
- B. If drawings, product submittals, samples, mockups, or other required submittals are incomplete or not properly submitted, the Authority will not review the submittal and will return it to the Contractor. The Authority will review a submittal no more than 2 times without additional charge to the Contractor. The Contractor shall pay all review costs associated with more than 2 reviews.

## **1.7 AUTHORITY REVIEW**

- A. The Authority will review submittals and re-submittals, and return submittal comments within 7 calendar days of receipt.
- B. The Authority or authorized agent will receive, review and return submittals to the Contractor with one of the following dispositions noted:
  - “Approved” – denotes that the submittal is generally consistent with the requirements of the Contract Documents. A resubmittal is not required.
  - “Approved with Corrections Noted” – denotes that the submittal is generally consistent with the requirements of the Contract Documents but only as

conditioned by notes and corrections made on the submittal. A resubmittal is not required provided the Contractor understands the review comments and desires no further clarification.

“Revise and Resubmit” – denotes that revisions are required in the submittal in order for the submittal to be generally consistent with the requirements of the Contract Documents. The Authority will indicate on the returned submittal what revisions are necessary. A resubmittal is required.

“Rejected” – denotes that the submittal does not meet the requirements of the Contract Documents and shall not be used in the Work. The Authority will indicate on the returned submittal the reasons for its rejection. A resubmittal is required.

- C. Review by the Authority of submittals 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 submittals shall not relieve the Contractor of the responsibility for compliance with the requirements of the Contract Documents or for errors, dimensions, and quantities unless specific exception is requested and approved on the submittal.
- D. The Authority’s review shall not extend to the means, methods, techniques, sequences or procedures of construction 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 which the item functions.

## **1.8 DISTRIBUTION**

- A. The Contractor shall be responsible for making and distributing any reproductions of approved submittals that it may require for its use.
- B. The Contractor shall perform work in accordance with approved submittals.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01 33 23**

### **SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

#### **PART 1 – GENERAL**

##### **1.1 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 31 19 – Project Meetings.
- D. Section 01 33 00 – Submittal Procedures.
- E. Section 01 45 00 – Quality Control.
- F. Section 01 60 00 – Material and Equipment.
- G. Section 01 73 00 – Execution Requirements.
- H. Section 01 78 39 – Project Record Documents.
- I. Technical Specifications: Identification of submittal requirements.

##### **1.2 SHOP DRAWINGS**

- A. Present in a clear and thorough manner. Label each Shop Drawing with Authority's Project name, Project number and date of submittal. Identify each element of the Shop Drawings by reference to specification section, sheet number and detail, schedule, or Area of Work.
- B. The data shown on the Shop Drawings shall be complete with respect to specified performance and design criteria, materials and similar data to show the Authority materials and equipment the Contractor proposes to provide.
- C. Identify dimensions; show relation to adjacent or critical features or Work or products.
- D. Designation of work “by others”, if shown in submittals, shall mean that work will be responsibility of Contractor rather than subcontractor or supplier who has prepared submittals.
- E. Minimum Sheet Size: 11"x17".

### **1.3 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, piping and control diagrams; 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.
- C. Submit manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, commissioning, and finishing.

### **1.4 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 as specified in technical product sections.
- 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. Samples shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which they are intended, and otherwise as the Authority may require, to enable the Authority to review the submittal.
- E. Label each sample with identification required for transmittal letter.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01 42 19**

### **REFERENCE STANDARDS**

#### **PART 1 – GENERAL**

##### **1.1 RELATED SECTION**

- A. Section 00 70 00 – General Conditions.

##### **1.2 QUALITY ASSURANCE**

- A. For Products or workmanship specified by association, trade, or other technical 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 of bid advertisement, unless otherwise stated in the Contract Documents.
- C. Provide copies of standards through the submittal process when required by the Contract Documents. Maintain a copy of each reference standard on site during construction.
- D. Should specified reference standards conflict with Contract Documents, request clarification from the Authority before proceeding. Local code requirements, where more stringent than referenced standards, shall govern.
- E. Neither the contractual relationship, duties, and responsibilities of the parties to the Contract, nor those of the Engineer, shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

##### **1.3 CODES, STANDARDS, AND REGULATORY REQUIREMENTS**

- A. All work shall be in accordance with the latest edition of governing Codes, Standards and regulatory requirements, including but are not limited to:
  - 1. International Fire Code (IFC).
  - 2. National Fire Protection Association (NFPA) NFPA 30.
  - 3. International Building Code (IBC).
  - 4. National Electrical Code (NEC).
  - 5. National Electrical Safety Code (NESC)
  - 6. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME).

7. American Petroleum Institute (API).
8. American Society of Testing and Materials (ASTM).
9. American Society of Mechanical Engineers (ASME).
10. American Welding Society (AWS).
11. American Institute of Steel Construction (AISC).
12. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
13. Alaska Department of Commerce, Community and Economic Development (DCCED) 12 AAC 32
14. Alaska Department of Commerce, Community and Economic Development (DCCED) 12 AAC 39
15. Alaska Department of Environmental Conservation (ADEC) 18 AAC 75.
16. Steel Structures Painting Council (SSPC).
17. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01 43 10**

### **CONTRACTOR QUALIFICATIONS**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Contractor's technical qualifications to be able to execute the Work in accordance with the Contract Documents.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 01 33 00 – Submittal Procedures.
- C. Section 01 45 00 - Quality Control.
- D. Technical Specifications: Contractor and Fabricator Qualifications.

##### **1.3 SUBMITTALS**

- A. As part of the Submittal process submit evidence of qualifications as required by this section and the Technical Specifications.
- B. The subcontractor list shall designate the party responsible for the portion of Work requiring specific qualifications.

##### **1.4 CONTRACTOR QUALIFICATIONS - GENERAL REQUIREMENTS**

- A. The Contractor shall meet all technical requirements of the Contract Documents. The Contractor may use sub-contractors as required to meet the requirements. The Authority may request documentation of all required qualifications after the bid opening and prior to award in order to verify Contractor qualifications.

##### **1.5 CONTRACTOR QUALIFICATIONS - SPECIFIC REQUIREMENTS**

- A. In accordance with Alaska statutes and regulations, all Electrical work falling under the scope of 12 AAC 32.075 shall be performed under the supervision of an Electrical Administrator with a current license in the State of Alaska in the Unlimited Linework Category.
- B. In accordance with Alaska statutes and regulations, all Electrical work falling under the scope of 12 AAC 32.165 shall be performed under the supervision of an Electrical Administrator with a current license in the State of Alaska in the Unlimited Commercial Wiring Category.

- C. In accordance with Alaska statutes and regulations, all Mechanical work falling under the scope of 12 AAC 39.212 shall be performed under the supervision of a Mechanical Administrator with a current license in the State of Alaska in the Unlimited Commercial and Industrial Plumbing Category.
- D. Fabricators for specialty equipment such as engine-generators, switchgear, fire suppression, etc. shall meet the minimum requirements of the technical specifications.
- E. Initial testing of the system will require the Contractor to run the engine-generators. The Contractor shall engage qualified personnel with a minimum of five years experience in the operation of diesel generators and switchgear similar to the equipment being used in this project. Initial startup of all engines shall be performed by the qualified personnel.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 45 00**  
**QUALITY CONTROL**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Contractor's quality assurance program and control procedures for executing the Work.

**1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 01 33 00 – Submittal Procedures.
- C. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- D. Section 01 42 19 – Reference Standards.
- E. Section 01 43 10 - Contractor Qualifications.
- F. Section 01 60 00 – Material and Equipment.
- G. Technical Specifications: Testing and Reporting requirements.

**1.3 SUBMITTALS**

- A. As part of the Submittal process submit proposed testing forms as required by the Technical Specifications. Note that upon request the Authority can provide the Contractor forms for common tests such as tank and piping pressure test, phase rotation, continuity and insulation, etc.

**1.4 GENERAL**

- A. The Contractor shall provide and maintain an effective Quality Control Program related to testing and inspection. The Contractor shall perform Quality Control Testing as specified and shall provide copies of all results to the Authority for use in observing contract compliance.
- B. The Contractor's Quality Control Program shall include, but is not limited to: administration, management, supervision, reports, record-keeping, submittals, services of independent testing agencies and labs, and other related services.
- C. Quality Control is the sole responsibility of the Contractor.
- D. Specific Quality Control requirements are included in the Technical Specifications. General Quality Control requirements entail ensuring that all

aspects of the Work conform to the technical requirements of the Contract Documents.

- E. The Contractor's Quality Control Program described herein is not intended to limit the Contractor's Quality Control activities, which may be necessary to achieve compliance with the Contract Documents.

## **1.5 JOB CONDITIONS**

- A. Where Specifications require work to be field-tested or approved, it shall be tested in the presence of the Authority after timely notice of its readiness for inspection and testing, and the work after testing shall be concealed only upon approval of Authority. The Authority shall have the right to witness all tests.
- B. The results of tests are for use by the Authority to evaluate the acceptability of Work with respect to specified testing requirements. Regardless of the test results, Contractor is solely responsible for quality of workmanship and materials and for compliance with requirements of Contract Documents.
- C. Maintain quality control over sub-contractors, suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality. Verify applicability and follow all manufacturers' recommendations and instructions for assembly, installation and testing of materials and equipment. In any case where the Contractor believes that such recommendations or instructions are not applicable, the Contractor shall so notify the Authority and state the reasons for the Contractor's determination. The Contractor shall then follow the Authority's written direction on whether to follow manufacturer's recommendations and instructions.
- D. Upon failure of Work which has been tested or inspected, previous acceptance may be withdrawn and Work be subject to removal and replacement with Work in accordance with the Contract Documents, at no cost to the Authority.

## **1.6 MANUFACTURER'S FIELD SERVICES**

- A. Required when technical specifications require the manufacturer or fabricator to provide qualified personnel to observe field conditions, installation, quality of workmanship, and to start, test, and adjust equipment as applicable.
- B. Submit to the Authority the manufacturer or fabricator representative's written reports containing observations and recommendations within five (5) calendar days of manufacturer's field services.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

- A. The Contractor shall provide full and complete documentation of Quality Control procedures and activities.

### **3.2 QUALITY CONTROL**

- A. The Contractor shall establish the methodology to perform the Contractor's inspection and tests of all items including that of its subcontractors. The Contractor shall ensure conformance to applicable technical specifications and drawings with respect to the materials, Codes, workmanship, storage, installation, construction, finishes, functional performance, and identification. The Contractor shall ensure quality for all construction work performed under this Contract, including assigned subcontract work. The Contractor shall specifically include surveillance and tests required in the technical specifications.
- B. The Contractor shall coordinate all work requiring Special Inspection, where specified, to ensure full access by Special Inspectors and Quality Assurance testing personnel.
- C. The Contractor shall provide, as a minimum, the following components for all definable features of work:
  - 1. Preparatory Inspection Meeting: Contractor shall schedule and attend a preparatory meeting to review testing procedures a minimum of a week prior to beginning work on any element of Work which has been identified in the Contract Documents to require testing and inspection by the Contractor and Code-required Special Inspection. Subsequent meetings shall be conducted as necessary to ensure continued accuracy of testing and inspection procedures.
  - 2. Document Control: Contractor shall have and follow a procedure for ensuring that all Work is performed in accordance with the following:
    - a. Conformed sets of Contract Drawings and Specifications.
    - b. Contract Change Order documents.
    - c. Approved Submittals.
    - d. Applicable Requests for Information (RFI's) or Design Clarification Verifications (DCVR's).
    - e. Manufacturer's Instruction.

3. In Progress Inspection: Contractor shall perform in-progress inspections as work progresses on the Work which shall include, but not be limited to:
  - a. Examination of the quality of workmanship with respect to Contract Drawings, Technical Specifications and Approved Submittals.
  - b. Review of control testing for compliance with Contract requirements.
  - c. Inspection for use of defective or damaged materials, omissions and dimensional requirements.
  - d. Review of timeliness and scheduling requirements for all tests, retests and eventual approvals.
4. Non-Conformance Procedure: Contractor shall have and follow a procedure for identifying, documenting, tracking, and resolving items in the Work which do not comply with Contract Documents, Specifications, Approved Submittals, or Manufacturer's Instructions. If a quality control test indicates that the tested material does not conform to the requirements of the Contract Documents, the Contractor shall take supplemental tests at the same location from which the non-conforming result was obtained, after correction of the work, to document conformance with the Contract Documents. Otherwise, the Authority reserves the right to reject materials for which final Quality Control tests indicate non-conformance with the Contract Documents.
5. Code Required Inspection: Contractor shall coordinate and make timely requests for inspections, tests and other activities required by Codes and Regulations as specified.

### **3.3 RECORD KEEPING**

- A. The Contractor shall maintain current Quality Control records, on forms acceptable to the Authority, of all inspections and tests performed. The records shall include factual evidence that the required inspections or tests have been performed, including, but not limited to, the following information for each such test and inspection: Specification reference, date, type and number of inspections or test involved; results of the inspections, tests or retests; the nature of defect, causes for rejection, proposed remedial action, corrective action(s) taken, and similar information related to any re-inspection.
- B. The Contractor shall maintain the following Quality Control records and reports and shall submit to the Authority as required:
  1. The Contractor shall fill out test reports immediately upon completion of each test. Test reports shall be signed and dated and shall include

adequate photographs to document test procedure and conditions. Test reports shall be submitted with the daily report for the day of testing.

2. **Inspection Logs:** The Contractor shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. The Inspection Log shall include compliance with shop drawings submittals, identification by Specification section and schedule activity of inspections, tests, and retests conducted, results of inspections and tests, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed. The Inspection Log shall be available for review by the Authority upon request.
3. **Immediate Notification of Deficiencies:** Contractor shall provide immediate notification to the Authority whenever a failed or nonconforming test or inspection occurs. This immediate notification shall be followed up with a written report describing the deficiency and a correction plan.

### **3.4 ORGANIZATION**

- A. **Staffing Levels:** Provide sufficient qualified personnel to monitor the work quality at all times. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity.
  1. In cases where multiple trades, disciplines or subcontractors are on site at the same time, each activity shall be inspected and tested by personnel skilled in that portion of the work.
  2. In cases where multiple shifts are employed, the Quality Control staff shall be increased as required to monitor the work on each shift.

### **3.5 QUALITY SURVEILLANCE BY THE AUTHORITY**

- A. All items of materials and equipment shall be subject to surveillance testing and inspection by the Authority at the point of production, manufacture or shipment to determine if the producer, manufacturer or shipper maintains an adequate inspection system which ensures conformance to the applicable specifications and drawings with respect to materials, workmanship, construction, finish, functional performance and identification. In addition, all items or materials, equipment and work in place shall be subject to surveillance testing and inspection by the Authority at the site for the same purposes. Surveillance by the Authority does not relieve the Contractor of performing Quality Control inspections and testing of either onsite or offsite Contractor's or subcontractor's workplace or manufacturing assembly plant.

**END OF SECTION**

**SECTION 01 51 00**  
**CONSTRUCTION FACILITIES**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Requirements for furnishing and maintaining construction facilities during the project.

**1.2 RELATED REQUIREMENTS**

- A. Section 01 11 13 – Summary of Work.
- B. Section 01 29 76 – Application for Payment.
- C. Section 01 73 00 – Execution Requirements.

**1.3 TEMPORARY ELECTRICITY**

- A. Unless specified elsewhere, the Contractor shall make their own provisions for temporary electrical service.
- B. Provide lighting for construction operations.
- C. Provide additional lighting for inspections if requested by Authority or Engineer.

**1.4 TEMPORARY HEAT**

- A. Provide and pay for heat devices, insulated enclosure, tenting, and heat as required to maintain specified conditions for construction operations, to protect equipment, materials, and finishes from damage due to temperature or humidity.

**1.5 TEMPORARY VENTILATION**

- A. Provide and pay for ventilation of enclosed areas to cure materials, to disperse humidity, to prevent accumulations of dust, fumes, vapors, or gases, and to maintain a safe work environment.

**1.6 TEMPORARY WATER SERVICE**

- A. Unless specified elsewhere, the Contractor shall make its own provisions for temporary water service.

**1.7 TEMPORARY SANITARY FACILITIES**

- A. Unless specified elsewhere, provide and maintain required sanitary facilities and enclosures.

**1.8 TEMPORARY TELEPHONE AND INTERNET SERVICE**

- A. Unless specified elsewhere, provide, maintain and pay for telephone and internet service to the Contractor field offices.

**1.9 FREEZE PROTECTION**

- A. Provide freeze protection for temporary water service piping, batteries, switchgear, and other components.

**1.10 PROTECTION OF INSTALLED WORK**

- A. Protect installed Work and provide special protection where required and where Work is installed in unsecure areas.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

**1.11 SECURITY**

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

**1.12 REMOVAL OF UTILITIES AND FACILITIES**

- A. Remove Construction Facilities, Services, Utilities and other related materials, prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore permanent facilities used during construction to a 'like new' condition if it was provided by Contract, or the condition the facility was found prior to construction of this project for existing facilities.

**1.13 COST RESPONSIBILITY**

- A. Except as otherwise noted, the cost of construction facilities and utilities shall be the responsibility of Contractor.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01 60 00**

### **MATERIAL AND EQUIPMENT**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Requirements for transportation and handling, storage and protection, substitutions, and product options.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 33 00 – Submittal Procedures.
- D. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- E. Section 01 42 19 – Reference Standards.
- F. Section 01 45 00 – Quality Control.
- G. Section 01 51 00 – Construction Facilities.
- H. Section 01 73 00 – Execution Requirements.

##### **1.3 TRANSPORTATION AND HANDLING**

- A. Transport products by methods to avoid product damage; deliver in dry, undamaged condition, in manufacturer's unopened containers or packaging.
- 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.

#### **1.4 STORAGE AND PROTECTION**

- A. Handle and store materials for construction, products of demolition, and other items to avoid damage to existing buildings, and infrastructure.
- 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. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- D. 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 or transported away from the stockpile.
- E. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

#### **1.5 SUBSTITUTIONS**

- A. Prior to the bid opening, the Bidder shall make his own determination in selecting which specified or substitute equipment to base his proposal upon. Substituted items shall be equal to or better than that specified or indicated in regards to quality, workmanship, finish, space requirements, mechanical and electrical requirements, performance, and warranties.
- B. After the bid opening, the Contractor shall submit sufficient data in accordance with this Section to establish equality. The Authority shall be the sole judge of equality and acceptability.
- C. Acceptance of substitute materials will not relieve the Contractor of the responsibility for any changes in his own Work or in the Work of other crafts caused by the substitution. Any additional costs resulting from substitutions are the responsibility of the Contractor.
- D. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.
- E. The Authority will consider requests for Substitutions only within 28 days after date established by the Notice to Proceed.
- F. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

- G. Document each request with complete data substantiating compatibility of proposed Substitution with Contract Documents.
- H. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

## **1.6 SUBSTITUTION SUBMITTAL PROCEDURE:**

- A. Submit Request for Substitution for consideration on Substitution Request Form provided by the Authority (Section 01 60 00-A). Limit each request to one proposed Substitution.
- B. Submit certification signed by the Contractor, that the Contractor:
  - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product. List similar projects using proposed product, dates of installation and user telephone number.
  - 2. Will provide an equivalent warranty for the Substitution as for the specified Product.
  - 3. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional cost to the Authority.
  - 4. Waives claims for additional costs or time extension, which may subsequently become apparent from indirect costs.
  - 5. Will reimburse the Authority for review or redesign services associated with re-approval by Authorities.
- C. Submit shop drawings, manufacturers' product data, and certified test results attesting to the proposed Product equivalence and variations between substitute and specified product. The burden of proof is on proposer.
- D. The Authority will notify the Contractor in writing of decision to accept or reject request.

## **PART 2 – PRODUCTS**

### **2.1 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.

## **2.2 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers followed by the term "No Substitutions": use only specified manufacturers, no substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named that meets the description specifications of the named manufacturers, equal in substance, function, dimension, appearance, and quality.

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**



Project: Nikolai and Venetie Power System and Bulk Fuel Upgrade Projects Project No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Specified item for which substitution is requested: \_\_\_\_\_  
(reference specification section and paragraph)

The following product is submitted for substitution: \_\_\_\_\_  
(describe proposed substitution and differences from specified item; attach complete technical, performance, and test data; state whether substitution affects dimensions and functional clearances shown on drawings or affects other trades, and include complete information for changes to drawings and/or specifications which proposed substitution will require for its proper installation.)

I certify the following:

- | Yes                      | No                       |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | The substitute will perform adequately and achieve the results called for by the general design.   |
| <input type="checkbox"/> | <input type="checkbox"/> | The substitute is similar, of equal substance, suited to the same use, and will provide the same warranty as the product specified.  |
| <input type="checkbox"/> | <input type="checkbox"/> | An equivalent source of replacement parts is available.  |
| <input type="checkbox"/> | <input type="checkbox"/> | The evaluation and approval of the proposed substitute will not delay the Substantial or Final Completion of the project.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Any change in the design necessitated by the proposed substitution will not delay the Substantial or Final Completion of the project.  |
| <input type="checkbox"/> | <input type="checkbox"/> | The cost of any change in the design necessitated by the proposed substitution, including engineering and detailing costs, and construction costs caused by the substitution will be paid by the Contractor at no cost to the Authority. |
| <input type="checkbox"/> | <input type="checkbox"/> | The cost of any license fee or royalty necessitated by the proposed substitution will be paid by the Contractor at no cost to the Authority.   |

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_  
Authorized Contractor Signature

Architect/Engineer Recommendation:

- Accepted       Accepted as Noted       Not Accepted       Received Too Late

Remarks:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_  
Architect/Engineer

Accepted  
 Rejected  
\_\_\_\_\_ Date: \_\_\_\_\_  
Project Manager



## **SECTION 01 71 13**

### **MOBILIZATION AND DEMOBILIZATION**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Requirements for mobilization and demobilization.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 01 11 13 – Summary of Work.
- B. Section 01 29 73 – Schedule of Values.
- C. Section 01 29 76 – Application for Payment.
- D. Section 01 51 00 – Construction Facilities.
- E. Section 01 77 00 – Contract Closeout Procedures.

##### **1.3 DEFINITIONS**

- A. Mobilization and Demobilization includes:
  - 1. Contractor's work to prepare Site for Work under Contract and to marshal workers, materials and equipment, and those of subcontractors, to accomplish the Work.
  - 2. Mobilization of all construction equipment, materials, supplies, appurtenances, and the like, staffed and ready for commencing and prosecuting the Work, and the subsequent demobilization and removal from the site of said equipment, appurtenances, and the like upon completion of the Work.
  - 3. Assembly and delivery to the Site all equipment, materials, and supplies necessary for the prosecution of Work which are not intended to be incorporated in the Work; the clearing of and preparation of the Contractor's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

#### **1.4 REQUIREMENTS**

- A. Haul routes, staging areas, and equipment positioning at the project site will be subject to approval by Authority, who will coordinate with Contractor to determine requirements and locations.
- B. Cooperate with Authority in allocation and use of Mobilization and Demobilization areas of Site, field offices and sheds, materials storage, traffic, and parking facilities.
- C. During construction, coordinate use of Site and facilities through the Authority.
- D. Comply with Authority's procedures of contract communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of Authority for use of utilities and construction facilities.
- F. Coordinate field engineering and layout Work under instructions of Authority.
- G. Walk through Site with Authority prior to start of Work.

#### **1.5 SUBMITTALS**

- A. Refer to Section 01 33 00 – Submittal Procedures, for submittal requirements.
- B. If requested by Authority, submit a plan of the proposed layout of the construction site, including equipment, access ways, temporary facilities, staging, and storage areas, within thirty (30) days after Notice to Proceed.

#### **PART 2 – PRODUCTS (NOT USED)**

#### **PART 3 – EXECUTION**

##### **3.1 EXECUTION REQUIREMENTS**

- A. Delivery to the jobsite of construction tools, equipment, materials, and supplies shall be accomplished in conformance with local governing body, ordinances, regulations, and the requirements of the Contract Documents.
- B. Upon completion of the Work, remove construction tools, apparatus, equipment, unused materials and supplies, and personnel from the jobsite.

**END OF SECTION**

**SECTION 01 71 23.16**  
**CONSTRUCTION SURVEYING**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Construction surveying requirements.

**1.2 RELATED REQUIREMENTS**

- A. Existing survey data and survey control are presented on the Drawings.
- B. Available electronic survey data is available to the contractor upon request.
- C. Section 01 33 00 – Submittal Procedures.

**1.3 SUBMITTALS**

- A. Submit, upon request of the Engineer, copies of all field notes and survey data.
- B. Provide marked-up as-built drawings.

**PART 2 – PRODUCTS**

**2.1 SURVEY MATERIALS**

- A. Provide all construction surveying and staking materials to stake construction work.

**PART 3 – EXECUTION**

**3.1 SURVEYING BY ENGINEER**

- A. No surveying will be provided by the Engineer.

**3.2 CONTRACTOR RESPONSIBILITIES**

- A. Contractor shall set all lines and grades by instrument survey in order to correctly layout the following:
  - 1. Building foundation.

2. Proposed Utilities.
  3. All other Construction.
- B. Contractor shall provide vertical and horizontal as-built locations of buried utilities.
  - C. Contractor shall locate and protect all survey reference points. Contractor shall have a Professional Land Surveyor, licensed in the State of Alaska, reset any survey points that have been disturbed at Contractor's expense.
  - D. Survey shall be tied to the basis of horizontal and vertical control indicated on the Drawings.
  - E. Contractor shall provide and pay for all surveying as required for project completion and acceptance.
  - F. Field-adjust grades to meet the minimum fill depth required by the Drawings.

### **3.3 ACCURACY AND TOLERANCES**

- A. Contractor's surveys shall be subject to the following tolerances, unless another tolerance is specified elsewhere in the Contract Documents:
  1. Building Foundation:  $\pm 1/4$ -inch in 10 foot.
  2. All other Construction:
    - a.  $\pm 0.10$  feet horizontally.
    - b.  $\pm 0.10$  feet vertically.

### **3.4 RECORDS**

- A. Maintain a complete, accurate, and reduced set of field notes of all survey work and submit all notes to the Engineer at the conclusion of work and as requested.

**END OF SECTION**

## **SECTION 01 73 00**

### **EXECUTION REQUIREMENTS**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Requirements for addressing defects, cleaning, operating and maintenance manuals, spare parts, training, warranties and bonds, and maintenance service.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions: Fiscal provisions, legal submittals, and other administrative requirements.
- B. Section 01 26 63 – Change Procedures.
- C. Section 01 31 19 – Project Meetings.
- D. Section 01 33 00 – Submittal Procedures.
- E. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- F. Section 01 60 00 – Material and Equipment.
- G. Section 01 74 00 – Cleaning and Waste Management.

##### **1.3 CLOSEOUT PROCEDURES**

- A. Comply with Section 01 77 00 - Contract Closeout Procedures.

##### **1.4 DEFECTS**

- A. Product defects shall be all items that affect the visual appearance or function of the Products. Defects shall be as identified below unless more stringent requirements are specified within specific sections.
- B. Products shall typically be viewed from a distance of 30.0 inches (760 mm).
- C. Defects shall be solely determined by the Authority.
- D. Defects, Product:
  - 1. Cuts, Scrapes, Gouges Abrasions 0.250 inch (6 mm) long or longer, and 0.03125 inches (0.79375 mm) wide or wider that are visible at a distance of 30.0 inches (762 mm) shall be considered defects.
  - 2. Abrasions less than the above shall be accepted.

3. Burns of any size that permanently discolor the surface material shall be considered defects.
  4. Product color variation.
- E. Defects, Joint:
1. Non-alignment of Products. Visual defects and non-alignment of joints shall be considered defective.
- F. Defects, Structural:
1. Bent members or other structural damage shall be considered defective.
  2. Incorrectly manufactured members shall be considered defective.
- G. Defects, Corrosion:
1. Surface corrosion not exceeding one percent (1%) of the surface area shall be considered a visual defect.
  2. Surface corrosion exceeding one percent (1%) and not exceeding five percent (5%) of the surface area shall be evaluated by the Authority to determine defect type.
  3. Surface corrosion exceeding five percent (5%) of the surface area shall be considered a structural defect.
- H. Defects shall be repaired or replaced at no additional cost to the Authority.
1. Structural defects shall be replaced, no exceptions.
  2. Visual defects shall be repaired or replaced as solely determined by the Authority.

## **1.5 PROGRESS CLEANING AND WASTE REMOVAL**

- A. Maintain work and storage areas free of waste materials, debris, and rubbish. Maintain site in a neat and orderly condition to maintain safe passage and exits and to avoid fire and tripping hazards. Provide covered containers for deposit of waste materials.
- B. Collect and remove waste materials, debris, and rubbish from site periodically and at least weekly, and dispose off-site. Have equipment and personnel available on-site daily to sweep and clean work sites and interior work areas.
- C. Comply with Section 01 74 00 – Cleaning and Waste Management.

## **1.6 FINAL CLEANING**

- A. Execute final cleaning prior to Substantial Completion inspection.
- B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances.
- C. Use materials which will not create hazards to health or property, and which will not damage surfaces. Follow manufacturer's recommendations.
- D. Maintain cleaning until the Authority issues certificate of Substantial Completion.
- E. Remove waste, debris and surplus materials from site. Clean work site and interior work areas; remove stains, spills, and foreign substances from all areas and sweep clean. Rake clean work site. Comply with Section 01 74 00 – Cleaning and Waste Management.

## **1.7 ADJUSTING**

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

## **1.8 OPERATION AND MAINTENANCE (O&M) DATA**

- A. Provide Operation and Maintenance Manuals for specific equipment as described in the Technical Specifications. For this project O&M Manuals are only required for the engine-generators, the switchgear, and the fire suppression system.
- B. Unless otherwise directed in these documents or by the Authority, provide each submittal as an electronic portable document format (PDF) file, transmitted via email. If file is too large to be received by the Authority via email, provide a download link, deliver in portable USB drive, or as otherwise instructed by the Authority

## **1.9 TRAINING**

- A. Before Substantial Completion, instruct the local operator(s) and Authority's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

## **1.10 SPARE PARTS AND MAINTENANCE PRODUCTS**

- A. Provide spare parts, maintenance, and extra Products in quantities specified in the Technical Specifications. These shall be labeled and stored per manufacturer's recommendations and as specified.
- B. Deliver to Project site and place in location as directed; obtain receipt prior to Substantial Completion payment.

**1.11 WARRANTIES AND BONDS**

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01 74 00**

### **CLEANING AND WASTE MANAGEMENT**

#### **PART 1 – GENERAL**

##### **1.1 GENERAL**

- A. During the term of this Contract, the Contractor shall remove as promptly as possible any materials and equipment which are not required for the completion of the Work. All debris shall be removed from the site and disposed of daily. The Contractor shall take particular care to eliminate any hazards created by these operations.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 01 73 00 – Execution Requirements.

#### **PART 2 – PRODUCTS (NOT USED)**

#### **PART 3 – EXECUTION**

##### **3.1 PROGRESS CLEANING**

- A. At the completion of the project, or prior thereto if so directed by the Authority, the Contractor shall be responsible for completely cleaning those portions of the project which his work affects.
  - 1. Contractor shall remove from the facility all tools, equipment, surplus materials, debris, temporary structures, and other material not incorporated in the permanent installation.
- B. Restoration of Damaged Property: To the extent that any roads, vegetation, structures, utilities, or other items are damaged or displaced by the Contractor's operations, these shall be restored to their original or better condition prior to Substantial Completion inspection. This shall include both on-site and off-site items. Any damage which is severe enough to disrupt community travel or utilities shall be repaired by the Contractor immediately.
- C. Cleaning, repair, and restoration must be accomplished prior to Final Inspection, to the satisfaction of, and at no additional cost to the Authority.
- D. Disposal of hazardous and construction materials shall be accomplished as specified in Section 00 70 00 – General Conditions and this Section.

### **3.2 WASTE DISPOSAL**

- A. Salvaged Material.
  - 1. All salvaged items not being reinstalled shall be turned over to the Owner or Utility as indicated in the Drawings.
  
- B. General Construction Waste.
  - 1. General construction waste generated during the process of completing the project scope of work shall be removed from the limits of the project site and disposed of. All general construction waste shall be disposed of as required by local, state and federal laws, rules, regulations and requirements.

**END OF SECTION**

## **SECTION 01 77 00**

### **CONTRACT CLOSEOUT PROCEDURES**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Requirements for Substantial Completion.
- B. Requirements for Final Completion.
- C. Requirements for Final Acceptance and Payment.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions: Substantial Completion, Final Completion, Final Payment, Final Acceptance.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 29 73 – Schedule of Values.
- D. Section 01 29 76 – Application for Payment.
- E. Section 01 33 00 – Submittal Procedures.
- F. Section 01 73 00 – Execution Requirements
- G. Section 01 78 39 – Project Record Documents.

##### **1.3 SUBSTANTIAL COMPLETION SUBMITTALS**

Submit the following prior to requesting the Substantial Completion Inspection:

- A. Evidence of Compliance with Requirements of the Authority Having Jurisdiction:
  - 1. Required Certificates of Inspection.
  - 2. Pre-Commissioning Substantial Completion Inspection Checklist
  - 3. Other approvals as may be required.
- B. Project Record Documents.
- C. Operation and Maintenance Data.
- D. Spare Parts and Maintenance Materials.

- E. Warranties and Bonds.
- F. Keys and Keying Schedule.
- G. No progress payments will be made for Substantial Completion until all required submittals have been submitted and accepted by the Authority.

#### **1.4 SUBSTANTIAL COMPLETION**

- A. In accordance with Section 00 70 00 – General Conditions, Article 13.10 Substantial Completion, the Contractor shall notify the Authority in writing that the Work or a portion of the Work which has been specifically identified in the Contract Documents (except for items specifically listed by the Contractor as incomplete) is substantially complete and request that the Authority issue a Certificate of Substantial Completion. The Authority will consider the Contractor's request for Substantial Completion only when:
  - 1. Written request for Substantial Completion is provided at least ten (10) calendar days in advance of the Substantial Completion inspection date.
  - 2. List of items to be completed or corrected is submitted.
  - 3. All Operation and Maintenance Manuals are submitted and approved by the Authority.
  - 4. All equipment and systems have been tested, adjusted, are properly operating and fully operational.
  - 5. All automated and manual controls are fully operational and the entire system is ready for commissioning.
  - 6. Test reports for required tests have been submitted for all required tests.
  - 7. Spare parts, maintenance materials, keys, etc. are on site and available to be turned over to the Authority.
  - 8. All warranties and bonds are submitted and approved.
- B. When all of the preceding requirements for the consideration of Substantial Completion have been met, the Authority and/or their designee will conduct a scheduled Substantial Completion inspection. If upon the completion of the inspection, the Authority should find that the Work is not substantially complete, the Authority will promptly notify the Contractor in writing, listing observed deficiencies.
- C. The Contractor shall remedy deficiencies and send a second written notice of Substantial Completion.

- D. When the Authority finds the Work is substantially complete, it will issue a certificate of Substantial Completion with an attached punch list of deficiencies, all in accordance with the provisions of the General Conditions.
- E. The Contractor shall be responsible for scheduling the activities required for Substantial Completion to enable completion within the Contract Time.

### **1.5 FINAL COMPLETION**

- A. In accordance with Section 00 70 00 – General Conditions, Article 13.13 Final Completion, when the Contractor considers that it has completed all the deficiencies listed on the Substantial Completion punch list, and that the Work is otherwise complete, it shall submit written certification that:
  - 1. Contract Documents have been reviewed.
  - 2. Work has been completed in accordance with Contract Documents, and deficiencies listed with certificate of Substantial Completion have been corrected.
  - 3. Work is complete and ready for final inspection.
- B. Upon the receipt of the preceding written notice, the Authority will conduct a Final Completion inspection. If the Authority should then find the Work to be incomplete, it will promptly notify the Contractor in writing with a list of observed deficiencies.
- C. The Contractor shall remedy deficiencies and transmit to the Authority a second certification of Final Completion.
- D. The Authority reserves the right to review photographic documentation in lieu of on-site inspection.
- E. When the Authority determines the Work is complete, all in accordance with the General Conditions article, “Final Completion and Application for Payment”, the Contractor may make application for Final Payment.

### **1.6 REINSPECTION FEES**

- A. In accordance with Section 00 70 00 – General Conditions, Articles 13.10 Substantial Completion and 13.12 Final Inspection, the Contractor shall pay for all costs incurred by the Authority for re-inspection.
- B. The Authority may deduct the re-inspection costs from the application for final payment.

## 1.7 FINAL ACCEPTANCE AND PAYMENT

- A. Following the issuance of Final Completion, and subject to the completion of requirements specified in Section 00 70 00 – General Conditions, Articles 13.14 Final Payment and 13.15 Final Acceptance, the Authority will review the project files for completeness. The Authority may require the Contractor to submit or re-submit any of the following documents, upon request:
1. Contractor's transmittal letter: O&M Manuals.
  2. Contractor's transmittal letter: Warranty/Bonds.
  3. Contractor's transmittal letter: Record Documents.
  4. Spare parts, maintenance materials receipts.
  5. Contractor's transmittal letter: Keys & keying schedule.
  6. Contractor's certification of insurance.
  7. EEO compliance certification (Federally funded projects only).
  8. Submittals and miscellaneous registers.
  9. Original final pay estimate.
  10. Contractor's release.
  11. Department of Labor Notice of Completion (NOC).
  12. Other documentation as required by the Authority.
- B. Statement of Adjustment of Accounts – The Authority may require the Contractor to submit a final statement reflecting adjustments to the Contract Price showing:
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 Re-inspection Fees.
  9. Other adjustments to Contract Price.
  10. Total Contract Price as adjusted.
  11. Previous payments.
  12. Sum remaining due.
- C. The Authority will issue a final Change Order reflecting all remaining adjustments to Contract Price not previously made by Change Orders.
- D. See Section 01 29 73 – Schedule of Values for minimum value that shall be assigned for Final Acceptance.
- E. The Contractor shall cooperate with the Authority and shall provide the requested documentation.
- F. When the Authority determines its files are complete, it will make final payment and issue a letter of Final Acceptance.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**



## CERTIFICATE OF SUBSTANTIAL COMPLETION

---

**Project:** Nikolai & Venetie Power System and Bulk Fuel Upgrade Projects

**A/E Project Number:** \_\_\_\_\_

**To:** \_\_\_\_\_

**Community:** \_\_\_\_\_

**Contract Number:** \_\_\_\_\_

**From:** Alaska Energy Authority

**Contract Date:** \_\_\_\_\_

---

The work performed under this contract has been reviewed and found to be substantially complete. The date of substantial completion of the project or portion thereof designated above is hereby established as \_\_\_\_\_ which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

### **Definition of Date of Substantial Completion**

The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the Project Manager when construction is sufficiently complete in accordance with the Contract Documents, so the \_\_\_\_\_ can occupy or utilize the work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

A list of items to be completed or corrected, prepared by the Project Manager is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work associated with the Contract Documents.

The date of commencement of warranties for items on the attached list will be the date of final payment unless otherwise agreed to in writing.

Attachments:

---

**Alaska Energy Authority:** \_\_\_\_\_

Project Manager

**Date:** \_\_\_\_\_

---

## **SECTION 01 78 39**

### **PROJECT RECORD DOCUMENTS**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

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

##### **1.2 RELATED REQUIREMENTS**

- A. Section 00 70 00 - General Conditions: Record Documents.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 29 76 – Application for Payment.
- D. Section 01 33 23 – Shop Drawings, Product Data.
- E. Section 01 77 00 – Contract Closeout Procedures.
- F. Technical Specifications: Manufacturer's certificates and certificates of inspection.

##### **1.3 MAINTENANCE OF RECORD DOCUMENTS**

- A. In addition to requirements in General Conditions, maintain at the site for the Authority one accurate and up to date record copy of:
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings and product data.
  - 6. Field test records.
  - 7. Inspection certificates.
  - 8. Manufacturer's certificates.

- B. Prior to Substantial Completion, provide original or legible copies of each item maintained by the Contractor.
- C. Delegate responsibility for management of maintenance of Record Documents to one person on the Contractor's staff as approved in advance by the Authority.
- D. Promptly following award of Contract, secure from the 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 the Authority.
- J. Do not use job set for any purpose except entry of new data and for review and copying by the Authority.
- K. Keep record documents and samples available for inspection by the Authority.
- L. Upon request by the Authority, and at time of each Application for Payment, enable inspection of Record Documents by the Authority for review as to completeness.
- M. Prior to submitting request for Final Payment, obtain the Authority's approval of final Record Documents.

#### **1.4 RECORDING**

- A. Record information on a set of 'black-line' opaque Drawings, and in a copy of a Project manual, provided by the 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 RFI's, 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 locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
  - 2. Field changes of dimension and detail.
  - 3. Changes made by modifications.
  - 4. Details not on original Contract Drawings.
  - 5. References to related Shop Drawings and modifications.
  - 6. Clearly label all changes and show dimensions to establish size and location. All identifications shall be sufficiently descriptive to relate reliably to Specifications.
- F. Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records required by individual Specifications sections.

## **1.5 SUBMITTAL OF RECORD DOCUMENTS**

- 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. The 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 the Contractor or authorized representative.
- C. Final Record Documents shall include both hard copies and digitally scanned copies in \*.PDF format (high quality grayscale scans, minimum 200 pixels/inch). Scans

shall include front and back of drawings/documents where information occurs on both sides.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 02 32 00**  
**GEOTECHNICAL INVESTIGATIONS**

**PART 1 - GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Section 00 73 13 Supplementary Conditions.
- B. Section 31 23 00 Excavation and Fill.

**1.2 SOIL REPORTS**

- A. Existing Geotechnical Conditions:
  - 1. Geotechnical reports were completed for this project in 2020/2021 and are located immediately following this page.
  - 2. Copies of the Geotechnical reports are included in these bid documents for informational purposes. However, contractor understands that actual field conditions may vary significantly.
  - 3. Site photos are available upon request.
  - 4. 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.
  - 5. Prior to bidding, Contractor may make his own investigations, as approved by the project manager and owner, to satisfy himself with site and subsurface conditions.

**PART 2 - PRODUCTS**

Not Used.

**PART 3 - EXECUTION**

Not Used.

**END OF SECTION**

October 22, 2021

20368379 (Nikolai)

**Steve Stassel, PE**

Gray Stassel Engineering, Inc.  
1000 O'Malley Road, Suite 200b  
Anchorage, AK 99515

**GEOTECHNICAL CONSIDERATIONS, RURAL POWER SYSTEM UPGRADE (RPSU), NIKOLAI, ALASKA**

Steve:

This letter presents the results of our review of historic geotechnical data and geotechnical considerations for the Alaska Energy Authority (AEA) planned Rural Power System Upgrade (RPSU) in Nikolai, Alaska. This submittal addresses several design refinements subsequent to our February 15, 2021 recommendations for the planned development in Nikolai. This work has been performed in accordance with our proposal and professional services agreement with Gray Stassel Engineering, Inc. (GSE) and consultation with CRW Engineering Group (CRW). Our conclusions and recommendations are based primarily on our review of limited existing geotechnical data for the village.

GSE and select design team members conducted a site reconnaissance near the planned project location in fall 2020. GSE anticipated advancing a series of shallow exploration test pits at the new power plant site during the site reconnaissance. We understand local excavation equipment was not operational and COVID-19 constraints impacted alternative measures to advance test pits during the site reconnaissance. Per our agreement, we were not authorized to conduct a site and project specific geotechnical investigation to support our conclusions and recommendations. We recommend an on-site geotechnical evaluation to support final design.

## **1.0 PROJECT UNDERSTANDING**

As currently proposed, the development includes a new replacement powerplant, expected to be a site-built facility. A new 4,000-gallon skid mounted above grade intermediate fuel storage tank is included with the planned improvement. The currently preferred location for the replacement powerplant is on a previously undeveloped site between the school and airport apron, north of the abandoned tank farm. Diesel piston generators with associated switch gear are planned for this replacement power generation system.

The approximate location for the planned upgrades is noted on the following GoogleEarth image. The general location is considered approximate and may change as additional community input and design planning advances.



## 2.0 POWER PLANT SITING

The proposed power plant site supports the ability to tie into an existing buried diesel transfer pipeline from the tank farm as well as to provide recovered heat to the nearby school and community center. The replacement power plant is expected to be a nominal 18-foot by 40-foot single-story structure. The absence of regularly scheduled barge service to Nikolai and a 4,000-foot airstrip, the planned development supports a site fabricated wood or metal stud framed structure with metal roofing and siding. The floor system will be prefabricated steel framed floor panels welded together to provide liquid tight containment. It is anticipated that the foundation will consist of raised steel beams supported on concrete pads with adjustable shim plate leveling connections.

The structure will house a series of reciprocating piston prime mover electric power generators, electric switchgear and operation/maintenance facilities inside a heated building. New heat recovery will be provided to the school and community center. Buried heat recovery pipelines are planned to the school and community center. Fuel will be transferred through an existing buried pipeline from the community tank farm to a new 4,000-gallon double walled, skid mounted intermediate tank located adjacent to the new power plant.

## 3.0 HISTORIC GEOTECHNICAL DATA SUMMARY

Geotechnical data for this analysis were available from the following previous soil explorations in Nikolai. Copies of the select geotechnical data are provided in Appendix A:

- January 1980: Alaska Department of Transportation and Public Facilities (ADOT&PF) collected geotechnical information for the design of the airport and apron. ADOT&PF advanced 21 test borings along the planned airstrip and apron area. Test boring TH-19 is nearest the proposed RPSU development. At the time of the field effort (30 July 1979) TH-19 encountered approximately 2 feet of surface organics and organic silt with a

distinct contact with a mineral silty sand to sandy non-plastic silt to the base of the exploration, nine feet below ground surface at the time of the field effort (bgs). Seasonal frost was indicated from 1.5 to 4 feet bgs with unfrozen soils below the seasonal frost to the exploration depth. Groundwater was not encountered in the test hole during the exploration effort.

- April 2001: ADOT&PF collected additional geotechnical information for an upgrade to the airport and apron. ADOT&PF advanced 18 test pits along the planned airstrip and apron area. Test pits TP 3-96, TP 4-96 and TP 5-96 are nearest the proposed RPSU development. At the time of the field effort (mid-May 1996) all three test pits encountered generally similar subsurface conditions, approximately 1.5 of surface organics and organic silt with a distinct contact with a mineral silty sand to sandy non-plastic silt to the base of the exploration, approximately 15 feet (5 meters) below ground surface at the time of the field effort (bgs). Seasonal frost was indicated from 1.5 to 4 feet bgs with unfrozen soils below the seasonal frost to the exploration depths. Groundwater was not encountered in the test pits during the exploration effort.
- June 2001, a current GSE engineer observed a series of shallow test pits advanced for the current bulk fuel storage facility. Review of photographs of the test pits indicates a relatively thin surface organic mat overlying light brown silts or silty fine grained sands. Near the base of the excavation, a darker grey granular layer may have been encountered. Test pit logs and location of the test pits were not provided but are reportedly in or near the area of the existing AEA bulk fuel storage facility.

Further from the planned RPSU development area additional geotechnical assessments were conducted by Corwin (1989) and RZA Agra (1992). The Corwin report is primarily related to wastewater system upgrades and on-site septic system evaluations. Determining the precise locations for the Corwin data is difficult but appears to be generally related to residential buildings in the core area of the village. The Corwin data also included geotechnical test pits for the village wastewater lagoon. The RZA Agra data is located at the more recent subdivision north of the 'older' core village area and the airstrip.

Review of the Corwin and RZA Agra geotechnical findings indicated generally similar subsurface conditions as reported by ADOT&PF and indicated in the bulk fuel tank area test pit photographs. However, at isolated areas the Corwin data indicated either deeper surface frost or possibly permafrost ground thermal states may have been present. The Corwin test pits were advanced about 12 feet bgs. Permafrost soils were not encountered in the RZA Agra exploration logs to their approximate exploration depths, about 12 feet bgs.

The US Public Health Service (USPHS) advanced a water well for the school in April 1970 (or possibly 1976, the well log is uncertain on the date). The water well log indicated silty soils to about 28 feet bgs to a nominal 5 foot thick sand and gravel layer. Mixed sequences of sands, silt and clay were reported to about 69 feet bgs to a water bearing sand and gravel layer. The well boring was terminated at 75 feet bgs in a non-water bearing zone. Static water level was reported at 23 feet bgs at the time of the well drilling and development. Seasonal frost was inferred to about 5 feet bgs. No indications for frozen ground was reported below the seasonal frost layer. It is important to note that water well logs were not developed for geotechnical purposes and interpretation of water well logs data should be carefully considered if being considered for geotechnical purposes.

## 4.0 GEOLOGIC SETTING

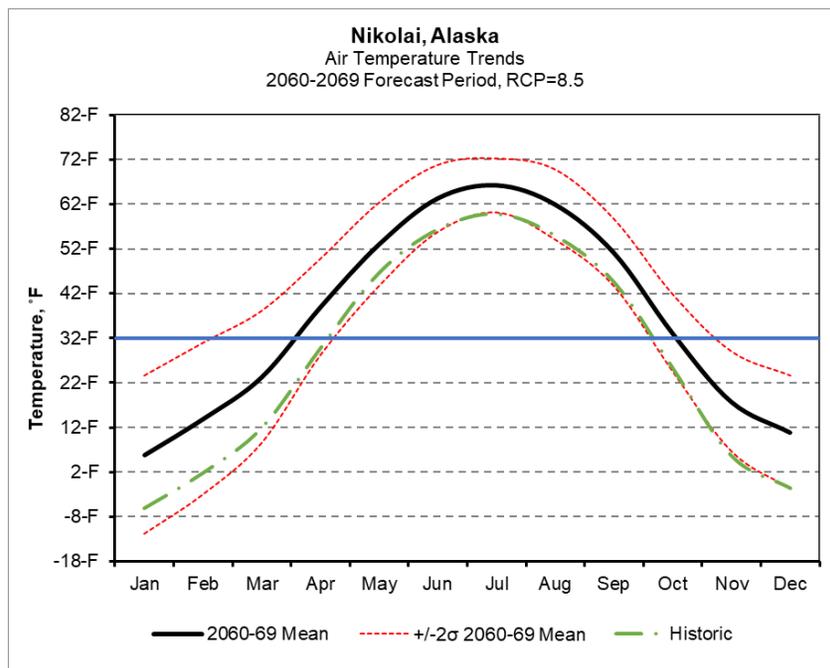
Nikolai is located in Interior Alaska on the south fork of the Kuskokwim River. A few low rolling hills and ridges in the generally flat alluvial plain characterize the topography of the Nikolai area. The Kuskokwim River and its associated tributaries cross this plain with frequent meanders and oxbow lakes. Braided streams occur up-river from the Nikolai area.

Nikolai is located in the Tanana-Kuskokwim lowlands physiographic province. The soils in the vicinity of Nikolai are of fluvial origins and are predominately silts and sands. The various glacial advances of the Alaska Range are the source of the fluvial deposition. The soils encountered are considered geologically recent, of Quaternary age. The Nikolai area has been mapped as generally underlain by isolated masses of permafrost, expected to be discontinuous and relatively warm, where encountered near the village.

Isolated and degraded permafrost conditions are inferred from the reviewed geotechnical data. In addition, variable thickness surface organics are reported throughout the area but in general surface organics are generally absent below 3 to 4 feet bgs.

## 5.0 GEOTECHNICAL ENGINEERING CLIMATE CONSIDERATIONS

Forecast air temperature trends were developed for the 2060-2069 period based on publicly available data developed by the University of Alaska Fairbanks, Scenarios Network for Alaska & Arctic Planning (SNAP) group. The SNAP group uses five Intergovernmental Panel on Climate Change (IPCC) General Circulation Models (GCM) they consider applicable for Alaska. SNAP includes several Representative Concentration Pathways (RCP) for their climate forecasts. For our analysis, we used an RCP of 8.5 (watts/m<sup>2</sup>) to estimate monthly average air temperatures for select forecast periods. The forecast climate model analysis results have variability. SNAP forecast data include the five GCM model average as well as a two standard deviation spread for the selected forecast period.



As noted in the above plot, continued air temperature warming is anticipated for the Nikolai area through at least the 2060-2069 forecast period used for our analysis. For the 2060-2069 forecast period the mean annual air temperature is forecast to warm with the colder range (two standard deviations below the forecast period mean) roughly similar to historic air temperature trends. If correct, these data indicate continued degradation permafrost can occur with deepening surface thaw and warming of the permafrost at depth throughout the area. Additional ground thermal impacts may occur due to localized drainage impacts, snow drifts, and surface disturbance from site or nearby development. Vegetation changes are also anticipated in response to the increasing warming trends.

For our engineering analysis, the key climate parameters derived from the SNAP data for Nikolai include Freezing Index (FI) and Thawing Index (TI), both as cumulate °F-days for each based on monthly average air temperature data. Summarized below are the SNAP derived approximate FI and TI data for the 1961-1990 historic and the 2060-2069 forecast period. As noted below, a general warming trend should be expected for the area over the project's anticipated service life.

<u>Period</u>		<u>Average Air Temperature</u>	<u>Freeze Index</u>	<u>Thaw Index</u>
1961-1990	Mean	27.3 F	4,770 F-days	3,200 F-days
2060-2069	5 Model Mean	36.6 F	2,660 F-days	4,400 F-days
2060-2069	Mean +2σ	47.6 F	640 F-days	6,360 F-days
2060-2069	Mean -2σ	25.7 F	5,210 F-days	2,980 F-days

Historically, the average snowfall is 4 to 5 feet and cold temperatures and moderate winter winds can result in large accumulations of snow and drifts. Historic average annual rainfall on the order of 16-inches is reported.

## 6.0 GEOTECHNICAL SEISMIC CONSIDERATIONS

Based on our interpretation of the subsurface conditions encountered at this site and the general geology of the project area, we recommend soil Site Class “D” be applied for the planned development. Seismic ground motion parameters summarized below for this site were developed based, in part, on the 2012 International Building Code (IBC). The structural engineer, in conjunction with the design team, should determine the appropriate occupancy classifications to develop the appropriate seismic response parameters for these structures.

<u>Seismic Parameter</u>	<u>2012 IBC Reference</u>
Short Period Spectral Acceleration ( $S_s$ )	0.539g
1-second Period Spectral Acceleration ( $S_1$ )	0.256g
Site Amplification Coefficient ( $F_a$ ) for Soil Site Class "D"	1.356
Site Amplification Coefficient ( $F_v$ ) for Soil Site Class "D"	1.982
Short Period Spectral Response Acceleration ( $S_{MS}$ )	0.738g
1-second Period Spectral Response Acceleration ( $S_{M1}$ )	0.492g
$PGA_M$	0.298g

Determined for coordinates 63.0141°N, 154.3729°W, Class I/II/III Risk Category

The site may be underlain with saturated fine grained sands with variable fines content (material passing the US Number 200 sieve size) with the potential for soil liquefaction under specific groundwater and seismic conditions. Our recommendations do not include soil liquefaction assessment or mitigation measures. If a refined geohazard risk evaluation for seismic hazards at this site is warranted, a more detailed geotechnical investigation program will be required including geotechnical borings, sampling and analysis.

## 7.0 DISCUSSION

Based on the review of existing soils data and the relatively uniform conditions reported in the historic geotechnical data encountered throughout the village, we expect generally similar soil materials and ground thermal states at the proposed RPSU site. Based on our review of the historic geotechnical data and the reported behavior of the school and other key public structure foundations near the proposed RPSU site, thaw unstable permafrost is not anticipated at the planned development area. However, the planned development area is characterized by brush and trees that may have preserved permafrost in this area with variable ice contents. A site specific geotechnical investigation is needed to determine permafrost conditions and thaw strain potential at this site.

For our analysis, we have assumed several feet of surface organics overlay mineral silt and fine-grained sands, expected to be primarily mineral silty sands. The mineral silts and sands are expected to extend at least 12 feet below grade and it is reasonable to assume they extend deeper. In general, a thin surface organic layer is expected to be present with the potential for peat sequences under the surface organics. The organic mat may be disturbed at some locations or covered with relict, unclassified local fill.

The underlying mineral silts and fine grained sands are expected to be medium dense to possibly loose since they are considered to be reworked fluvial deposits. These material are expected to have moderate shear strength when unfrozen but should be considered highly frost susceptible. The silt and fine grained sands should be expected to experience shear strength loss during thaw each summer, depending to a large extent on soil moisture content and the level of disturbance.

Seasonal frost is expected throughout the entire planned development area. Historic data indicated seasonal frost depths on the order of 4 to 5 feet bgs were encountered. However, seasonal frost depth can vary widely

depending on surface vegetation, albedo, soil moisture contents, local weather conditions and a wide variety of other variables. While we do not anticipate encountering extensive permafrost conditions at this site, the area is mapped as having permafrost soils. The historic geotechnical data, primarily the Corwin data, indicated encountering permafrost soils possibly in the 'older' portion of the village.

In general, the unfrozen mineral silts and fine grained sands are expected to provide adequate load bearing for the planned development provided a structural fill section is placed over the prepared mineral silt. To control settlements, all organic material and ice-rich soils should be removed under all load bearing and settlement intolerant areas for the planned developments.

The mineral silt is considered highly frost susceptible. Structure foundations and the skid mounted fuel tank should include frost protection measures to reduce the risk of seasonal frost related differential movements. If permafrost is present, it is expected to degrade in response to the planned site developments and longer-term climate warming trends. Permafrost degradation could result in thaw-related settlements, most likely differential, reflected at the ground surface. Provisions for releveling the structures, the bulk fuel tank, piping, and settlement intolerant facilities should be integral to the design.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our discussions with the design team, we understand shallow foundations as isolated pads are preferred for the new power plant foundation system. The pads will be either precast or cast-in-place concrete. A relatively narrow clear space between the base of the heated structure and finish grade is planned but conductive heat transfer from the building envelop through the foundations should be expected. A slab-on-grade design is not currently envisioned for the facility.

Based on our review of the historic geotechnical data in the general area of the planned RPSU development, the site is considered suitable for the proposed development using shallow foundations that bear on imported structural fill placed on the conditioned unfrozen, in-place mineral silt or silty sand. Our geotechnical recommendations are based, in part, on the foundations not being founded over permafrost soils or subjected to cyclic vibratory or machine loading states. If the building loads or prime movers are expected to impose vibratory or machine loads on the foundations, we must be contacted to review our recommendations presented herein.

The overlying organics and silty/sandy soil should be removed to at least three (3) feet below the base of the shallow foundation pads. The exposed in-place mineral silt should be fully thawed, moisture conditioned, scarified 6 to 8-inches deep and proof compacted to at least 95-percent of the material's maximum dry density as determined by the modified Proctor method, ASTM D-1557. A non-woven geotextile similar to Geotex 801 should be placed over the prepared in-place silt prior to structural fill placement.

Vibratory soil compaction methods are recommended but caution is recommended if the moisture contents of the silts and fine-grained sands are above optimum. The exposed mineral silt are considered highly moisture sensitive and can lose significant shear strength if disturbed above their optimal soil moisture range. Regaining shear strength of the disturbed silt on the wet side of its optimum moisture content can be challenging and may result in the need for dewatering, overexcavation, or other soil shear strength improvement methods.

The fine grained nature of the in-place soils is also conducive to high capillary forces. As such, exposed soils at soil moisture contents below or near optimum can experience water migration toward the compaction effort with

significant shear strength loss, conventionally termed soil 'pumping'. If this condition occurs, it may be difficult to control soil moistures to regain soil shear strength. Caution is advised during site preparation to avoid this issue.

Structural fill should be well-graded sand and gravel that meets the US Army Corps of Engineers Non-Frost Susceptible (NFS) classification or Possibly Frost Susceptible (PFS). Sand and gravel aggregates meeting S1 or S2 soil frost classification may be suitable for load bearing but should be expected to exhibit increased soil moisture sensitivity and increased seasonal frost related movements. For this project, we recommend all structural fill meet NFS or PSF soil frost classification with all particles passing a nominal 4-inch dimension. All structural fill should be moisture conditioned, fully thawed, and placed in nominal 12-inch thick lifts then densified using mechanical compaction methods as recommended for proof compacting.

The power plant design concept is expected to use an isolated, reinforced concrete square pad foundation system bearing on structural. We have assumed the foundation pads will be unheated. For all loading cases, the foundation pads should be between 3 to 5 feet square (9 to 25 square feet). If isolated foundation pads less than 9 or greater than 25 square feet we must be notified to review our recommendations.

For geotechnical purposes, we have assumed the isolated pads will be approximately 24-inches thick. The civil and structural engineer will develop isolated pad dimensions and geometry. The top of the isolated pads should be elevated approximately 5 inches above finish grade or as recommended by the civil and structural engineer. A minimum 8-inch high clear space between the base of the structure and finish grade is recommended to allow for drainage and seasonal frost movement within the fill under the structure.

A rigid insulation layer is recommended in the structural fill under the RPSU building foundations as a frost protection measure. The rigid insulation should be located over approximately two feet of structural fill and allow for a nominal 6-inch thick structural fill section between the base of the foundation pad and the top of the rigid insulation layer.

The rigid insulation should be at least 4-inches thick and extend at least five (5) feet horizontally in all directions from the foundation pad perimeter. The rigid insulation should be provided in 2-inch thick boardstock and placed with offset vertical joints. A fuel resistant liner is recommended over the rigid insulation that extends at least two (2) feet beyond the perimeter of the rigid insulation. We should review the final foundation frost protection measures during the design phase.

Rigid insulation should be an extruded or expanded polystyrene material with a minimum rated compressive strength of 40 pounds per square inch (psi) at no more than 10-percent strain. If so, the foundation pads can be designed for an allowable bearing pressure of 1,500 pounds per square foot (psf). If a rigid insulation with a rated compressive strength of 60-psi is used under the foundation pads, an allowable bearing pressure of 2,500-psf can be used. For all cases, a one-third increase in the allowable bearing pressure is permitted for short-term transient load states.

Structural fill should be placed above the rigid insulation layer to the finish grades developed by the civil engineer. Final grades should direct surface water away from the structure. Depending on the nature of the structural fill, additional armor material may be warranted along building driplines to reduce pad fill erosion.

Appurtenances attached to the building exterior should be designed to permit seasonal frost movements and differential settlement. Flexible connections and allowances for seasonal vertical and horizontal movements that will not result in damage are advised.

Lateral resistance can be developed as base friction between the cast-in-place concrete foundations and the underlying structural fill. A frictional resistance of 0.4 can be applied at the concrete foundation/structural fill contact provided the structure's dead load is used to determine lateral resistance. In addition, passive resistance can be developed along the vertical foundation faces using an equivalent fluid approach. For this case, an active and passive equivalent fluid pressure of  $30 \cdot H$  and  $200 \cdot H$  pounds per cubic foot (pcf), respectively, can be applied. For each case "H" is the vertical foundation face height in feet, with the uppermost one foot below finish grade ignored for the passive case.

Backfill along posts or stem walls (if used) should be placed and compacted as recommended for structural fill in a balanced manner to reduce lateral stresses along subgrade walls during construction. If retaining walls are planned for the development, we should be contacted to provide geotechnical guidance and recommendations.

If the site is not underlain with permafrost soils, prepared per our recommendations and the foundations placed in accordance with the design team's recommendations, a total settlement of 1.5-inch, differential of 1-inch is expected. If permafrost soils are present at the planned development site greater longer-term settlements related to permafrost degradation should be expected. If compressible soils or machine or cyclic loads are imposed on the foundations, a reduced allowable bearing capacity and/or increased settlements should also be expected. We must be contacted if in-place permafrost soils, compressible soils or cyclic vibratory or machine loads are encountered or are anticipated.

The 4,000-gallon intermediate fuel tank is expected to have an integral skid frame system for bearing on the prepared structural fill section. If additional bearing resistance for this tank is needed, all-weather-wood (AWW), steel or concrete foundation sills can be added. If additional controls for seasonal frost related movements are desired, a rigid insulation section similar to the RPSU building can be used. We should review the final foundation system for this tank.

## 9.0 CONSTRUCTABILITY CONSIDERATIONS

Select construction-phase considerations related to earthwork and foundation elements include:

- Pre-construction test pits to confirm our geotechnical assumptions at the RPSU location.
- If pre-construction test pits are not conducted, careful observation and logging of the subsurface conditions during site preparation by a member of the design team is recommended.
- The site preparation and structural fill placement should be observed by an experienced member of the design team.
- Seasonal fluctuations in the groundwater elevations should be expected, particularly during periods of prolonged precipitation. Construction phase dewatering may be required to achieve our recommended site preparation and foundation placement. If so, dewatering is considered the responsibility of the contractor and all required permits and monitoring should be conducted by the appropriate personnel.
- All finish grades should direct surface water away from the structures
- Roof drainages should consider armored material along their drip lines and channeled roof drainages should direct water away from the foundations.
- The contractor will be responsible for all construction-phase site safety including excavation sidewall stability.

## 10.0 USE OF REPORT

The summary geotechnical findings and recommendations presented herein were prepared for GSE and their design team for use in the planning and design of the proposed RPSU in Nikolai, Alaska. The geotechnical recommendations were developed based solely on review of historic geotechnical data. As such, all reviewers and users of this submittal must understand and accept the risks inherent with reliance solely on historic geotechnical data, particularly older data that may not reflect current ground thermal regime states. We will need to review the design plans and specifications as they are developed for conformance with our geotechnical recommendations provided with this submittal.

If there are significant changes in the nature, design, or location of the facilities, we should be notified so that we may review our conclusions and recommendations with consideration of the proposed changes and provide a written modification or verification of the changes.

Unanticipated soil conditions are commonly encountered and cannot fully be determined by a limited number of explorations or soil samples. Such unexpected conditions frequently result in additional project costs to build the project as designed. Therefore, a contingency for unanticipated conditions should be included in the construction budget and schedule. We consider this particularly critical for projects designed without site and project specific geotechnical investigations

The work program followed the standard of care expected of professionals undertaking similar work in Alaska under similar conditions. No warranty expressed or implied is made.

## 11.0 CLOSURE

Please be aware that Golder has been acquired by and is now a Member of the WSP family of companies. Golder remains a legal entity and is the proposed contracting entity for this submittal. We are in the process of integrating the resources of our companies. Correspondence for this submittal should continue to be addressed to the undersigned.

We appreciate the opportunity to provide work on this project. Please contact Richard Mitchells at 907-865-2537 if you have questions or comments.

**Golder Associates Inc.**

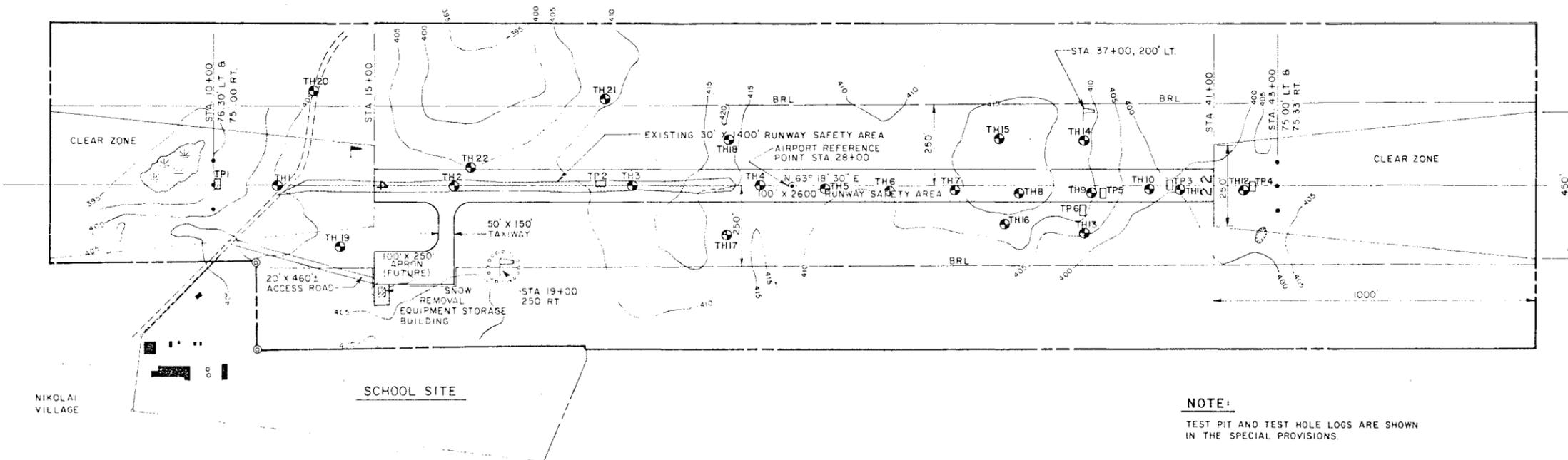
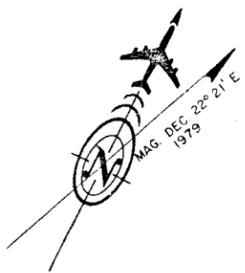


Richard Mitchells, PE  
*Principal*

Appendix A: Representative Historic Geotechnical Data

**APPENDIX A**

## Summary Historic Geotechnical Data



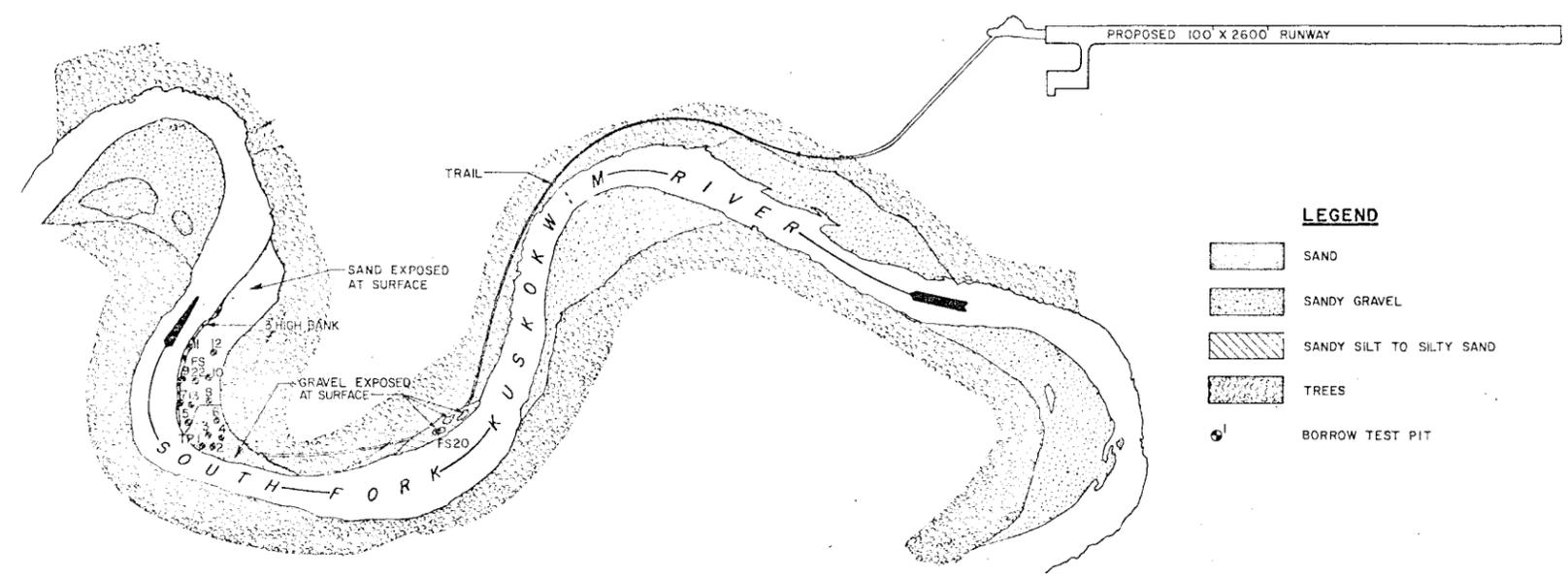
NIKOLAI VILLAGE

SCHOOL SITE

**NOTE:**  
TEST PIT AND TEST HOLE LOGS ARE SHOWN IN THE SPECIAL PROVISIONS.

**LEGEND:**  
 □ TP 1 TEST PIT  
 ● TH 1 TEST HOLE

**BORROW TEST PIT LOCATION PLAN**



SCALE  
APPROX. 1" = 430'

**LEGEND**  
 □ SAND  
 ▨ SANDY GRAVEL  
 ▩ SANDY SILT TO SILTY SAND  
 ■ TREES  
 ○ BORROW TEST PIT

BY	DATE	CHANGE

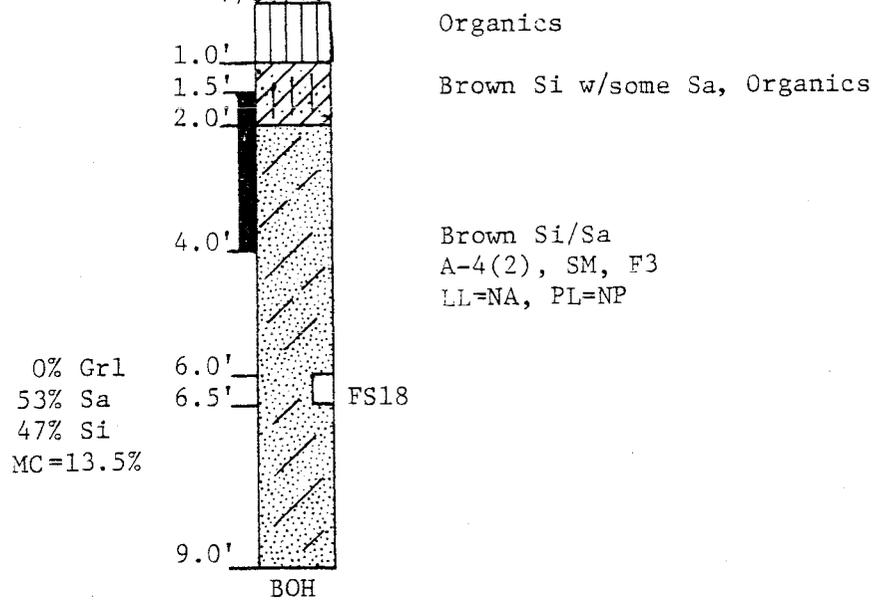
STATE OF ALASKA  
 DEPARTMENT OF TRANSPORTATION  
 AND PUBLIC FACILITIES  
 DIVISION OF AVIATION-DESIGN AND CONSTRUCTION

**NIKOLAI AIRPORT**

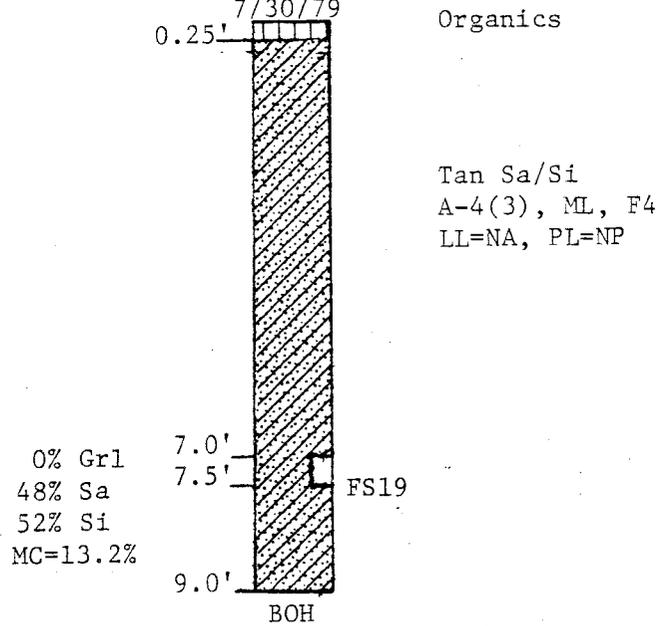
TEST HOLE & TEST PIT LOCATION PLAN

SCALE 1" = 200'	DESIGNED 	DRAWN M.R.
CHECKED 	DATE 11/13/79	

TH 19  
 STA 14+00  
 183' R of Centerline  
 7/30/79



TH 20  
 STA 13+00  
 292' L of Centerline  
 7/30/79



FIELD BORING LOGS

NIKOLAI RUNWAY

Designed D.A.S.

Drawn D. T.

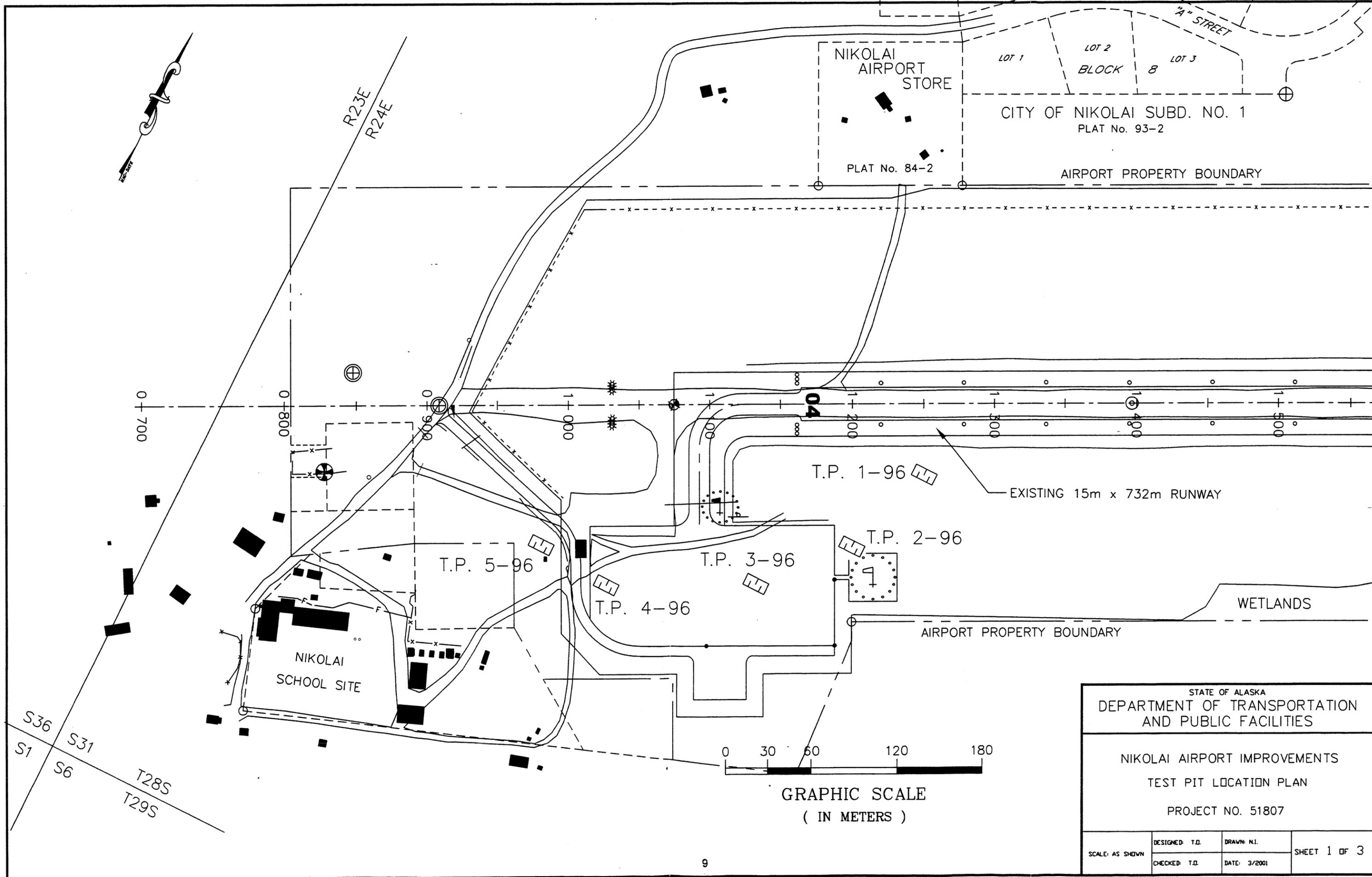
Scale 1"=3'

Sheet 10 of 11

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION

DIVISION OF AVIATION





STATE OF ALASKA DOT/PF  
 Central Region Materials  
 Geology Section

# LOG OF TEST HOLE

Sheet Number 1 of 1

Project Nikolai Airport Reconstruction  
 Project Number 51807

Test Hole Number TP 3-96  
 Total Depth 5 meters  
 Date Begin 5-18-96  
 Date End \_\_\_\_\_

Station / Location 1+130 Offset from Center Line 125m Rt Elevation Reference \_\_\_\_\_  
 Equipment Type Excavator Weather MOSTLY CLOUDY, 42 F, LIGHT WINDS, RAINED OVERNIGHT  
 Geologist T. OTTLEY Field Crew LES LEE

Drilling Method	Depth in (Meters)	Blows / 30 cm. Depth	Sample Data					Frozen	Soil Graph	Ground Water Data			
			Method	Number	Blow Count	Loc. Sampled	Recovery			N-Value	Depth in (m.)	Time	Date
Excavator	0.0									SUBSURFACE MATERIAL			
										Dark brown, wet, <i>Organic Or Peat</i> , with roots			
										Brown, <i>Sandy Silt</i> , with Organics and roots, contains visible ice			
	0.5									Brown, <i>Silty Sand</i> p0.075=20, Gravel=0%, Sand=80% SM			
	1.0		GS	FS-3-96									
	1.5		GS	FS-4-96						M.C.=4.1%			
	2.0												
	2.5												
	3.0												
	3.5												
4.0													
4.5													
5.0									BOH				

Drilling Notes:

LOG OF TEST HOLE NIKOLAI.GPJ AK\_DOT.GDT 2/28/01

Note: Unless otherwise noted all samples are taken with 1-3/8 inch Standard Penetration Sampler driven with 140 lb. hammer with 30-inch drop.  CME Auto Hammer  Cathead Rope Method



# LOG OF TEST HOLE

Sheet Number 1 of 1

STATE OF ALASKA DOT/PF

Central Region Materials

Geology Section

Project Nikolai Airport Reconstruction

Project Number 51807

Test Hole Number TP 4-96

Total Depth 5 meters

Date Begin 5-18-96

Date End

Station / Location 1+025

Offset from Center Line 125m Rt

Elevation Reference

Equipment Type Excavator

Weather MOSTLY CLOUDY, 42 F, LIGHT WINDS, RAINED OVERNIGHT

Geologist T. OTTLEY

Field Crew LES LEE

Drilling Method	Depth in (Meters)	Blows / 30 cm. Depth	Sample Data					Frozen	Soil Graph	Ground Water Data					
			Method	Number	Blow Count	Loc. Sampled	Recovery			N-Value	Depth in (m.)	Time	Date	Symbol	
Excavator	0.0		GS	FS-5-96						SUBSURFACE MATERIAL					
											Dark brown, wet, <i>Organic Or Peat</i> , with Roots				
												Brown, <i>Sandy Silt</i> , with Organics and Roots, contains visible ice			
												Brown, dry, <i>Sandy Silt</i>			
												M.C.=7.4%, p0.075=36, Gravel=0%, Sand=64%			
	5.0								BOH						

Drilling Notes:

LOG OF TEST HOLE NIKOLAI.GPJ AK DOT.GDT 2/28/01

Note: Unless otherwise noted all samples are taken with 1-3/8 inch Standard Penetration Sampler driven with 140 lb. hammer with 30-inch drop.  CME Auto Hammer  Cathead Rope Method



# LOG OF TEST HOLE

Sheet Number 1 of 1

STATE OF ALASKA DOT/PF

Central Region Materials  
Geology Section

Project Nikolai Airport Reconstruction  
Project Number 51807

Test Hole Number TP 5-96  
Total Depth 5 meters  
Date Begin 5-18-96  
Date End \_\_\_\_\_

Station / Location 0+980 Offset from Center Line 100m Rt Elevation Reference \_\_\_\_\_  
Equipment Type Excavator Weather MOSTLY CLOUDY, 42 F, LIGHT WINDS, RAINED OVERNIGHT  
Geologist T. OTTLEY Field Crew LES LEE

Drilling Method	Depth in (Meters)	Blows / 30 cm. Depth	Sample Data					Frozen	Soil Graph	Ground Water Data				
			Method	Number	Blow Count	Loc. Sampled	Recovery			N-Value	Depth in (m.)	Time	Date	Symbol
Excavator	0.0		CS	FS-6-96 & 7-96						SUBSURFACE MATERIAL				
	0.0										Dark brown, wet, <i>Organic Or Peat</i> , with Roots			
	0.0										Brown, <i>Organic Silt</i> , with Roots, contains visible ice			
	0.0										Brown, dry, <i>Silt</i> , with Sand			
	0.5													
	0.5										Brown, dry to moist, <i>Sl. Silty Sand</i>			
	0.5										A-3(0), SP-SM, M.C.=4.4%, p <sub>0.075</sub> =8, LL=NV, PL=NV, PI=NP, Gravel=0%, Sand=92%			
	0.5										Proctor Tests of FS-6-96 Optimum Moisture = 13.5% Maximum Dry Density = 1790 kg/cu m. Specific Gravity = 2.75 fine			
	1.0													
	1.0											Brown, dry to moist, <i>Silt</i> , contains Sand		
2.0														
2.5														
3.0														
3.5														
4.0														
4.5														
5.0														
									BOH					
									Drilling Notes:					

LOG OF TEST HOLE NIKOLAI.GPJ AK.DOT.GDT 2/28/01

Note: Unless otherwise noted all samples are taken with 1-3/8 inch Standard Penetration Sampler driven with 140 lb. hammer with 30-inch drop.  CME Auto Hammer  Cathead Rope Method





October 22, 2021

20148373

**Karl Hulse, PE**

CRW Engineering Group LLC  
3940 Arctic Blvd, Suite 300  
Anchorage, AK 99503

**GEOTECHNICAL CONSIDERATIONS, RURAL POWER SYSTEM AND BULK FUEL UPGRADES, VENETIE, ALASKA**

Karl:

This letter presents the results of our historic geotechnical data review and geotechnical considerations for the Alaska Energy Authority (AEA) planned Rural Power System Upgrade (RPSU) and Bulk Fuel Upgrade (BFU) in Venetie, Alaska. This work has been performed in accordance with our proposal and professional services agreement with CRW Engineering Group LLC (CRW) and consultation with Grey Stassel Engineering (GSE). Our conclusions and recommendations are based primarily on our review of existing geotechnical data for the village.

CRW and select design team members conducted a site reconnaissance at the planned RPSU and BFU locations on October 7, 2020. CRW anticipated advancing a series of shallow exploration test pits at the RPSU and possibly the BFU sites during the site reconnaissance. We understand local excavation equipment was not operational and COVID-19 constraints impacted alternative measures to advance test pits during the site reconnaissance. Per our agreement, we were not authorized to conduct a site and project specific geotechnical investigation to support our conclusions and recommendations.

## 1.0 PROJECT UNDERSTANDING

As currently proposed, the development has two primary components:

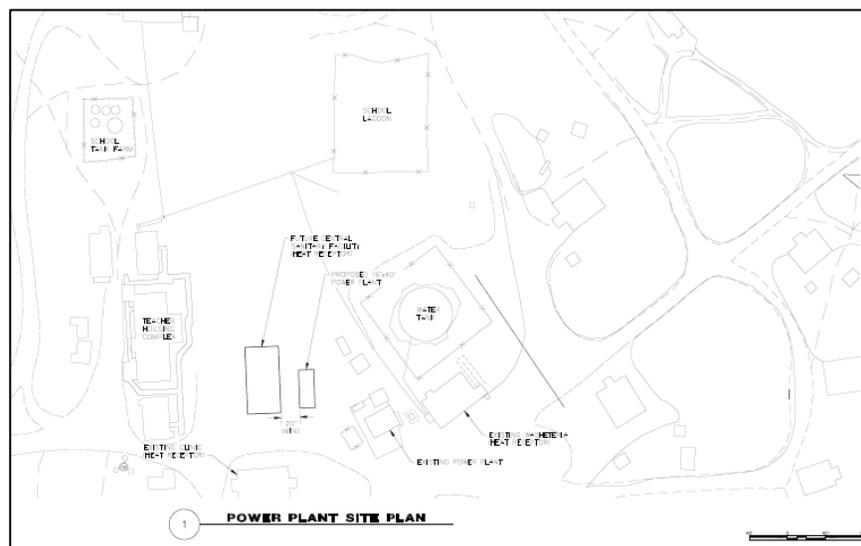
- RPSU as a new replacement powerplant, expected to be a modular design facility. The currently preferred location for the replacement powerplant is at the central utility core area of the village. Diesel piston generators with associated switch gear and bulk fuel storage will be planned for this replacement power generation system.
- BFU as new above grade fuel storage tanks at the airport apron. The new bulk fuel system is currently planned as two each 8,000-gallon skid mounted double wall tanks for diesel fuel and a single 5,000-gallon skid mounted double walled tank for motor gasoline. New fuel dispensing, fuel headers for air cargo fuel transfer, and new associated piping are planned. A new reinforced and lined truck fuel transfer pad will also be provided adjacent to the new fuel storage tanks.

The approximate locations for the planned upgrades are noted on the following GoogleEarth image. The general locations are considered approximate and may change as additional community input and design planning advances.



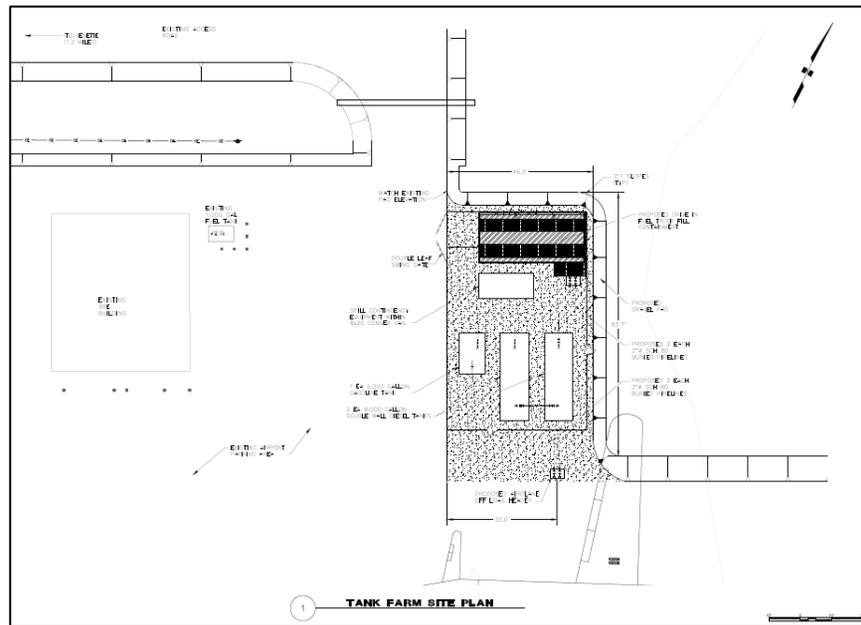
## 2.0 RPSU AND BFU SITING

Preliminary coordination meetings with village representatives and AEA personnel indicate the currently preferred location for the RPSU is in the general utility development core of the village, near the existing water storage tank. The approximate location for the replacement RPSU was provided by CRW:



The replacement RPSU is expected to be a nominal 16-foot by 40-foot single-story structure. A prefabricated steel module suitable for C130 transport is envisioned. The structure will house a series of reciprocating piston prime mover electric power generators, electric switchgear and operation/maintenance facilities inside a heated building. Fuel storage will be provided from a bulk fuel storage tank adjacent to the powerplant that will be refueled by truck from the primary BFU storage.

The new BFU is planned as an upgraded existing granular fill pad along the eastern side of the airport apron. The approximate location and planned geometry for the BFU is provided in the following conceptual site plan developed by CRW.



### 3.0 HISTORIC GEOTECHNICAL DATA SUMMARY

Geotechnical data for this analysis were available from the following previous soil explorations in Venetie:

- May 1979: Shannon & Wilson collected information for the design of the Venetie High School. Two exploratory borings, 20- and 25-feet in depth, were drilled at the proposed school site. The borings encountered 2 to 3 feet of surficial silt grading to silty sand, overlying silty, sandy gravel and gravelly, silty sand. Laboratory tests revealed water contents ranging from 3 to 10-percent (dry weight basis) and fines (material passing the US Number 200 standard sieve size) ranging from 18 to 36-percent by dry weight. This indicates these materials were frost susceptible. Seasonally frozen ground was present to depths of 3.5 to 5 feet and permafrost was found at depths of 7 feet in the wooded area to 12 feet below grade at the time of the field effort (bgs) in the cleared area.
- Spring/Summer 1978: Scott Wheaton, Geologist, conducted four subsurface soils investigations for the U.S. Public Health Service examining a total of 9 test pits, 16 test holes, and 10 water well borings to determine the suitability of on-site wastewater disposal throughout the village. He reported a fairly uniform soil sequence underlying the area, finding 5 to 8 feet of silt overlying dry, porous, sandy gravel, underlain by

bedrock encountered at 40 to 70 feet below grade. He observed that the silt and sandy gravel were 'dry-frozen', containing no pore or visible ice, and that the active layer was about 4 to 6 feet thick at the time of his field efforts.

- March 1985: J. M. Lambe and Associates conducted a subsurface investigation for an addition to the school. Eight borings, ranging from 24.5 to 30.5 feet in depth, were drilled near the proposed site, samples were collected, and laboratory tests performed. The typical soil profile underlying the site, considered consistent in all 8 test holes, was of 4 to 7 feet of frozen ice-rich silts, sandy silts, and organic materials underlain by frozen gravel. The moisture contents of gravel samples from one boring indicated that the gravels might be ice-rich in some areas. However, no significant excess ice was observed in any of the recovered samples, and neither massive ice nor thawed zones were encountered. All of the near surface silty soils are frost susceptible and thaw unstable. Down-hole temperatures measured shortly after completion of drilling found an average soil temperature of 29°F (in 1985).
- October 1998: Duane Miller & Associates presented the results of their soils investigation for the Venetie Airport Master Plan. In October 1997, subsurface conditions were documented at 30 locations by logging and sampling drilled borings, hand shovel excavations, cut banks, and by performing laboratory testing. Soil conditions were found to be uniform on the upper terrace consisting of silty sand and silty gravel overlain by 3 to 6 feet of olive brown silt and a thin organic mat. The silt was determined to be primarily eolian in origin with relatively low natural moisture contents and to be generally free draining when thawed. Permafrost was found to be significantly degraded. Frozen ground was encountered only in several heavily wooded areas and may have been remnant of seasonal frost. Seasonal thaw depths were found to range from 5 to 10 feet bgs. Sand and gravel fill material was found to be locally available. Specific to the 1998 geotechnical findings report, Alternative "C" location appears to be the current airstrip. The 1998 test pits VE-13, 17, 18, 24 and 25 were advanced at the Alternative "C" location. These test pits indicated 4 to 5 feet of silt overlying granular soils with variable frozen ground conditions.
- July 2019: HDL Engineering Consultants advanced four shallow test pits to support the foundation design for the current Central Sanitation Facility/Washeteria project for ANTHC. Subsurface conditions were primarily silt with increasing sand and gravel content with depth starting around 10 feet bgs. None of the test pits reported encountering permafrost conditions to the depth of the explorations, about 12 feet bgs.

## 4.0 GEOLOGIC SETTING

The village of Venetie is located on the north side of the Chandalar River approximately 45 miles northwest of Ft. Yukon and about 45 miles from the confluence of the Chandalar and Yukon Rivers. It is situated in the lowland area known as the Yukon Flats. The village was originally located on a lower geologic terrace immediately adjacent to the river. Flooding concerns resulted in the need for more space and the migration to the higher ground (upper geologic terrace). Most of the public structures and facilities are located on the upper geologic terrace.

Venetie lies near the base of the southern foothills of the Brooks Range. Gravelly glacial outwash from this range forms an alluvial fan underlying the area of the village. On the northeast bank, the river has cut the alluvial deposits to form steep bluffs, rising 30 to 40 feet above the floodplain to a generally flat terrace (upper geologic terrace). The upper geologic terrace is generally composed of alluvial granular material, primarily sand and gravel with varying amounts of fines. The granular material is overlain by 3 to 5 feet of eolian (wind blown) silt and a thin

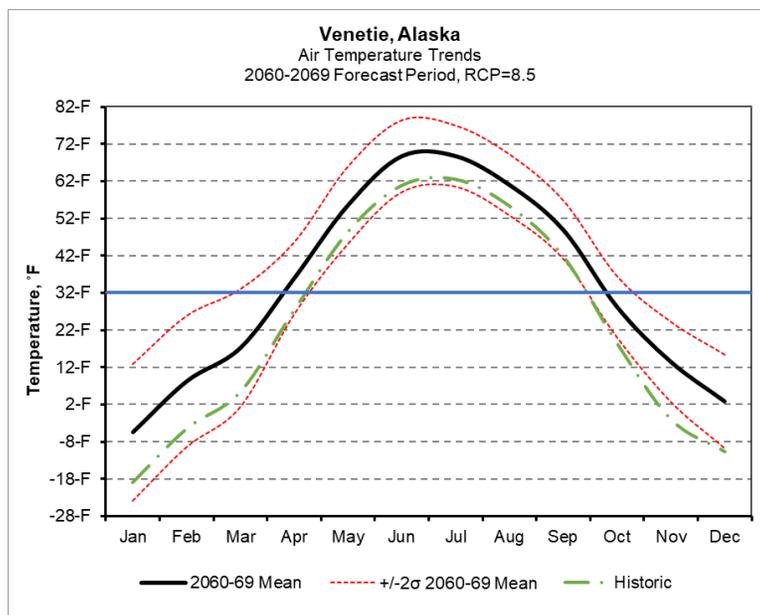
organic mat of forest duff and moss. However, thicker silt deposits are reported in the planned RPSU development area, up to 10 feet thick, before encountering soils with increased sand and gravel.

Degraded permafrost conditions are inferred from the reviewed geotechnical data. In addition, variable thickness surface organics are reported throughout the area but in general surface organics are generally absent below 3 to 5 feet bgs.

## 5.0 ENGINEERING CLIMATE CONSIDERATIONS

Forecast air temperature trends were developed for the 2060-2069 period based on publicly available data developed by the University of Alaska Fairbanks, Scenarios Network for Alaska & Arctic Planning (SNAP) group. The SNAP group uses five Intergovernmental Panel on Climate Change (IPCC) General Circulation Models (GCM) they consider most applicable for Alaska. SNAP includes several Representative Concentration Pathways (RCP) for their climate forecasts. For our analysis, we used an RCP of 8.5 (watts/m<sup>2</sup>) to estimate monthly average air temperatures for select forecast periods.

The forecast climate model analysis results have variability. SNAP forecast data include the five GCM model average as well as a two standard deviation spread for the selected forecast period.



As noted above, continued air temperature warming is anticipated for the Venetie area through at least the 2060-2069 forecast period used for our analysis. For the 2060-2069 forecast period the mean annual air temperature is forecast to warm with the colder range (two standard deviations below the forecast period mean) roughly similar to historic air temperature trends. If correct, these data indicate continued degradation permafrost can occur with deepening surface thaw and warming of the permafrost at depth throughout the area. Additional ground thermal impacts may occur due to localized drainage impacts, snow drifts, and surface disturbance from site or nearby development. Vegetation changes are also anticipated in response to the increasing warming trends.

For our engineering analysis, the key climate parameters derived from the SNAP data for Venetie include Freezing Index (FI) and Thawing Index (TI), both as cumulate °F-days for each based on monthly average air temperature data. Summarized below are the SNAP derived approximate FI and TI data for the 1961-1990 historic and the 2060-2069 forecast period. As noted below, a general warming trend should be expected for the area over the project’s anticipated service life.

<u>Period</u>		<u>Average Air Temperature</u>	<u>Freeze Index</u>	<u>Thaw Index</u>
1961-1990	Mean	23.6 F	6,330 F-days	3,400 F-days
2060-2069	5 Model Mean	33.6 F	3,860 F-days	4,500 F-days
2060-2069	Mean +2σ	45.1 F	1,500 F-days	6,330 F-days
2060-2069	Mean -2σ	22.1 F	6,550 F-days	3,020 F-days

Historically, precipitation in the area averages less than ten inches per year. The average snowfall is 3.5 to 4 feet, and cold temperatures and moderate winter winds result in large accumulations of snow. The prevailing winds are generally out of the northeast during winter and from the southwest during the summer.

## 6.0 GEOTECHNICAL SEISMIC CONSIDERATIONS

Based on our interpretation of the subsurface conditions encountered at this site and the general geology of the project area, we recommend soil Site Class “D” be applied for the planned developments (RPSU and BFU sites). Seismic ground motion parameters for this site were developed based, in part, on the 2012 IBC, summarized below. The structural engineer, in conjunction with the design team, should determine the appropriate occupancy classifications to develop the appropriate seismic response parameters for these structures.

<u>Seismic Parameter</u>	<u>2012 IBC Reference</u>
Short Period Spectral Acceleration ( $S_s$ )	0.555g
1-second Period Spectral Acceleration ( $S_1$ )	0.209g
Site Amplification Coefficient ( $F_a$ ) for Soil Site Class “D”	1.356
Site Amplification Coefficient ( $F_v$ ) for Soil Site Class “D”	1.982
Short Period Spectral Response Acceleration ( $S_{MS}$ )	0.753g
1-second Period Spectral Response Acceleration ( $S_{M1}$ )	0.415g
$PGA_M$	0.232g

Determined for coordinates 67.0148°N, 146.4168°W, Class I/II/III Risk Category

The site may be underlain with saturated sands with variable fines and gravel content with the potential for soil liquefaction under specific seismic conditions. Our recommendations do not include soil liquefaction mitigation measures. If a refined geohazard risk evaluation for seismic hazards at this site is warranted, a more detailed geotechnical investigation program will be required.

## 7.0 DISCUSSION

Based on the review of existing soils data and the relatively uniform conditions reported in the historic geotechnical data encountered throughout the village, we expect generally similar conditions at both the RPSU and BFU sites. However, at the RPSU site a thicker sequence of silty soil, approximately 10 feet thick, overlying the increasing sand and gravel layer is expected. In general, a thin surface organic layer is expected to be present but with the potential for peat sequences under the surface organics. The organic mat may be disturbed at some locations or covered with fill both sites, especially at the BFU site.

Silt is expected to underlie the surface organic layer with unfrozen mineral silts expected below 3 to 5 feet bgs. The silt is expected to have moderate strength when it is unfrozen but it is highly frost susceptible. The silt should be expected to experience shear strength loss during thaw each summer. As noted above, sandy gravel with variable fines content is present under the village starting at depths of 3 to 10 feet bgs and extends to depths of 30 feet bgs possibly deeper based on our review of historic geotechnical data.

In its pre-development state, the entire area away from the river thaw bulb was probably underlain by permafrost. Seasonal thaw depths probably ranged from about 5 to 10 feet bgs on the silt-covered terrace. Continued human activity in the area has altered the surface cover (albedo) resulting in continued permafrost degradation. It is reasonable to expect deeper thaw penetration at the proposed BFU area if fill is present and rigid insulation was not used in the fill section. However, bonded permafrost with variable ice contents can be expected at both planned development areas.

In general, the unfrozen mineral silt is expected at the planned development area. The unfrozen silt is expected to provide adequate load bearing for the planned developments provided a structural fill section is placed over the mineral silt. To control settlements, all organic material and ice-rich soils should be removed under all load bearing and settlement intolerant areas for the planned developments.

The unfrozen mineral silt is considered highly frost susceptible. Structure foundations, skid mounted fuel tanks, and the planned concrete truck fuel transfer pad should include frost protection measures to reduce the risk of seasonal frost related differential movements. If permafrost is present, it is expected to degrade in response to the planned site developments and longer-term climate warming trends. Permafrost degradation could result in thaw-related settlement reflected at the ground surface. Provisions for releveling the structures, bulk fuel tanks and piping, and settlement intolerant facilities should be integral to the design.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

### 8.1 RPSU Site

Based on our discussions with the design team, we understand a shallow foundations as isolated pads are preferred for the structure's foundation system. The pads will be either precast or cast-in-place concrete. A relatively thin clear space between the base of the heated structure and finish grade is planned but conductive heat transfer from the building envelop through the foundations is expected. A slab-on-grade design is not currently envisioned for the RPSU facility.

Based on our review of the historic geotechnical data in the general area of the planned RPSU development, the site is considered suitable for the proposed development using shallow foundations that bear on imported structural fill placed on the conditioned unfrozen, in-place mineral silt. Our geotechnical recommendations are based, in part, on the foundations not being subjected to cyclic vibratory or machine loading states. If the building loads or prime movers are expected to impose vibratory or machine loads on the foundations, we must be contacted to review our recommendations presented herein.

The overlying unclassified fill, organics, and silty soil should be removed to at least three (3) feet below the base of the shallow foundation pads. The exposed in-place mineral silt should be fully thawed, moisture conditioned, scarified 6 to 8-inches deep and proof compacted to at least 95-percent of the material's maximum dry density as determined by the modified Proctor method, ASTM D-1557. A non-woven geotextile similar to Geotex 801 should be placed over the prepared in-place silt prior to structural fill placement.

Vibratory soil compaction methods are recommended but caution is recommended if the moisture contents of the silt are above optimum. The exposed mineral silt are considered highly moisture sensitive and can lose significant shear strength if disturbed above their optimal soil moisture range. Regaining shear strength of the disturbed silt on the wet side of its optimum moisture content can be challenging and may result in the need for dewatering, overexcavation, or other soil shear strength improvement methods.

Structural fill should be well-graded sand and gravel that meets the US Army Corps of Engineers Non-Frost Susceptible (NFS) classification. For this project, we recommend all structural fill pass a nominal 4-inch dimension. All structural fill should be moisture conditioned, fully thawed and placed in nominal 12-inch thick lifts then densified using mechanical compaction methods as recommended for proof compacting.

The RPSU modular design concept is expected to use an isolated, reinforced concrete square pad foundation system bearing on structural. We have assumed the foundation pads will be unheated. For all loading cases, the foundation pads should be between 3 to 5 feet square (9 to 25 square feet). If isolated foundation pads less than 9 or greater than 25 square feet we must be notified to review our recommendations.

For geotechnical purposes, we have assumed the isolated pads will be approximately 24-inches thick. The civil and structural engineer will develop isolated pad dimensions and geometry. The top of the isolated pads should be elevated approximately 5 inches above finish grade or as recommended by the civil and structural engineer. A minimum 8-inch high clear space between the base of the module and finish grade is recommended to allow for drainage and seasonal frost movement within the fill under the module.

A rigid insulation layer is recommended in the structural fill under the RPSU building foundations as a frost protection measure. The rigid insulation should be located over approximately two feet of structural fill and allow for a nominal 6-inch thick structural fill section between the base of the foundation pad and the top of the rigid insulation layer.

The rigid insulation should be at least 4-inches thick and extend at least five (5) feet horizontally in all directions from the foundation pad perimeter. The rigid insulation be provided in 2-inch thick boardstock and placed with offset vertical joints. A fuel resistant liner is recommended over the rigid insulation that extends at least two (2) feet beyond the perimeter of the rigid insulation. We should review the final foundation frost protection measures during the design phase.

Rigid insulation should be an extruded or expanded polystyrene material with a minimum rated compressive strength of 40 pounds per square inch (psi) at no more than 10-percent strain. If so, the foundation pads can be designed for an allowable bearing pressure of 1,500 pounds per square foot (psf). If a rigid insulation with a rated compressive strength of 60-psi is used under the foundation pads, an allowable bearing pressure of 2,500-psf can be used. For all cases, a one-third increase in the allowable bearing pressure is permitted for short-term transient load states.

Structural fill should be placed above the rigid insulation layer to the finish grades developed by the civil engineer. Final grades should direct surface water away from the structure. Depending on the nature of the structural fill, additional armor material may be warranted along building driplines to reduce pad fill erosion.

Appurtenances attached to the building exterior should be designed to permit seasonal frost movements and differential settlement. Flexible connections and allowances for seasonal vertical and horizontal movements that will not result in damage are advised.

Lateral resistance can be developed as base friction between the cast-in-place concrete foundations and the underlying structural fill. A frictional resistance of 0.4 can be applied at the concrete foundation/structural fill contact provided the structure's dead load is used to determine lateral resistance. In addition, passive resistance can be developed along the vertical foundation faces using an equivalent fluid approach. For this case, an active and passive equivalent fluid pressure of  $30 \cdot H$  and  $200 \cdot H$  pounds per cubic foot (pcf), respectively, can be applied. For each case "H" is the vertical foundation face height in feet, with the uppermost one foot below finish grade ignored for the passive case.

Backfill along posts or stem walls (if used) should be placed and compacted as recommended for structural fill in a balanced manner to reduce lateral stresses along subgrade walls during construction. If retaining walls are planned for the development, we should be contacted to provide geotechnical guidance and recommendations.

Provided the silt underlying the development area is unfrozen, the site is prepared per our recommendations and the foundations placed in accordance with the design team's recommendations, a total settlement of 1-inch, differential of 0.75-inch is expected, in addition to any longer-term settlement related to permafrost degradation. However, if machine or cyclic loads are imposed on the foundations from the building or prime movers, a reduced allowable bearing capacity and/or increased settlements should be expected. We must be contacted if cyclic vibratory or machine loads are anticipated.

## 8.2 BFU Site

As currently envisioned, the BFU development includes two key elements; (1) new above grade, skid mounted bulk fuel storage tanks and (2) a reinforced concrete truck fuel transfer pad. The area for the planned development appears to have an unclassified fill pad of undetermined site preparation, geometry, and material properties. We recommend either (1) site exploration (test pits) to verify conditions at this site or (2) removal and segregation of the placed fill material for possible reuse and site preparation per our recommendations below.

### 8.2.1 Bulk Fuel Storage Area

The double-walled fuel tanks will be founded on skids that will bear on the structural fill surface. The bulk fuel storage is expected to be unheated. The skid-supported tanks will move vertically as the underlying mineral silt and possibly the structural fill freezes and thaws each year. Consequently, flexible connections should be

included in the piping between the tanks and the supply lines. Vertical ground movements could be on the order of 3 to 6 inches.

If differential movements related to seasonal frost and/or permafrost degradation can be tolerated, the bulk fuel tanks can be seated on a nominal three foot thick structural fill pad placed over firm, non-compressible mineral silt as recommended for the above RPSU site preparation, including a geotextile separation between the prepared silts and structural fill. However, this approach should be expected to require periodic tank releveling. If seasonal differential movements cannot be tolerated, overexcavation of the organic and mineral silts to thaw stable sand and gravel with structural fill material backfill is recommended.

The surface organic layer is expected to be relatively thin, generally less than 6 inches thick, but some thicker peat layers may be present. The organic layer could be removed and then replaced with structural fill. We do not envision the need for rigid insulation and fuel resistant liners in the planned bulk fuel storage area if differential movements and periodic releveling is acceptable.

### 8.2.2 Concrete Truck Fuel Transfer Pad

We have assumed the concrete slab for the truck fuel transfer facility will be unheated but will be relatively intolerant to differential movements. Accordingly, we recommend removal of all existing pad fill, organics, and compressible silts below the pad footprint and replacement with structural fill. Excavation should extend to in-place mineral granular soil. Use of a rigid insulation layer with a top fuel resistant liner is advised to reduce the longer-term risk of permafrost degradation and seasonal frost related movement. Site preparation, structural fill placement, and rigid insulation recommendations similar to the RPSU are recommended for the concrete truck fuel transfer pad

## 9.0 CONSTRUCTABILITY CONSIDERATIONS

Select construction-phase considerations related to earthwork and foundation elements include:

- Test pits to confirm our geotechnical assumptions are advised at both the RPSU and BFU locations.
- The site preparation and structural fill placement should be observed by an experienced member of the design team.
- Seasonal fluctuations in the groundwater elevations should be expected, particularly during periods of prolonged precipitation. Construction phase dewatering may be required to achieve our recommended site preparation and foundation placement. If so, dewatering is considered the responsibility of the contractor and all required permits and monitoring should be conducted by the appropriate personnel.
- All finish grades should direct surface water away from the structures, including finish grades under the RPSU module.
- Roof drainages should consider armored material along their drip lines and channeled roof drainages should direct water away from the foundations.
- The contractor will be responsible for all construction-phase site safety including excavation sidewall stability.

## 10.0 USE OF REPORT

The summary geotechnical findings and recommendations presented herein were prepared for CRW and GSE and their design team members for use in the planning and design of the proposed replacement RPSU and BFU facilities in Venetie, Alaska. The geotechnical recommendations were developed based solely on review of historic geotechnical data. As such, all reviewers and users of this submittal must understand and accept the risks inherent with reliance solely on historic geotechnical data, particularly older data that may not reflect current ground thermal regime states. We will need to review the design plans and specifications as they are developed for conformance with our geotechnical recommendations provided with this submittal.

If there are significant changes in the nature, design, or location of the facilities, we should be notified so that we may review our conclusions and recommendations with consideration of the proposed changes and provide a written modification or verification of the changes.

Unanticipated soil conditions are commonly encountered and cannot fully be determined by a limited number of explorations or soil samples. Such unexpected conditions frequently result in additional project costs to build the project as designed. Therefore, a contingency for unanticipated conditions should be included in the construction budget and schedule. We consider this particularly critical for projects designed without site and project specific geotechnical investigations

The work program followed the standard of care expected of professionals undertaking similar work in Alaska under similar conditions. No warranty expressed or implied is made.

## 11.0 CLOSURE

Please be aware that Golder has been acquired by and is now a Member of the WSP family of companies. Golder remains a legal entity and is the proposed contracting entity for this submittal. We are in the process of integrating the resources of our companies. Correspondence for this submittal should continue to be addressed to the undersigned.

We appreciate the opportunity to provide work on this project. Please contact Richard Mitchells at 907-865-2537 if you have questions or comments.

**Golder Associates Inc.**



Richard Mitchells, PE  
*Principal*

**SECTION 02 41 00**  
**DEMOLITION**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Selective demolition.

**1.2 RELATED REQUIREMENT**

**1.3 REFERENCE STANDARDS**

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION**

**3.1 SCOPE**

- A. Remove items intended for demolition as indicated on the Drawings.

**3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Provide, erect, and maintain temporary barriers and security devices.
  - 3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks without permit.

6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
  - C. If hazardous materials are discovered during removal operations, stop work and notify the Authority. Hazardous materials include but are not limited to fuels, regulated asbestos containing materials, lead, PCB's, and mercury.

### **3.3 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits and locates.
- B. Do not disrupt utilities without permit from authority having jurisdiction.
- C. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

### **3.4 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site or returned to the local utility company.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**SECTION 02 61 13**  
**EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. If the Contractor encounters contaminated soils during performance of the work, immediately stop work in the affected area and notify the Owner for instructions.
- B. Contractor shall not perform any unauthorized excavations. Any contaminated soils exposed as the result of unauthorized excavation shall be stockpiled in accordance with this specification at Contractor's expense.
- C. The discovery of contaminated soils shall not be cause for Contractor delay of work or equipment/worker standby time claims so long as there is other work that can be performed by the Contractor.
- D. This section describes procedures for stockpiling petroleum-contaminated soils.

**1.2 RELATED REQUIREMENTS**

- A. Section 02 80 10 Decommission Fuel Storage Tanks and Piping.

**1.3 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. API 2015 Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks.
- D. 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. All contaminated soil with visible free product encountered during excavation shall be contained and covered in accordance with the long-term stockpile requirement of 18 AAC 75 Section 370.
- B. Stockpile location shall be approved by the Owner.

## **1.5 ENVIRONMENTAL REQUIREMENTS**

- A. All contaminated soil stockpiles must be covered in accordance with 18 AAC 75 Section 370.
- B. Soil liners and covers must withstand 80 mile per hour winds, petroleum emersion, direct sunlight, and -40° F temperatures.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. All liners must meet 18 AAC Section 370 requirements.
- B. Personal Protection Equipment must be appropriate for hazardous encountered on the work site and meet requirements in 29 CFR Subpart I, Sections 1910.132-1910.139.
- C. Equipment to Monitor Hazardous Atmosphere. The contractor shall use oxygen meters, combustible gas indicators, colorimetric indicator tubes, or organic vapor monitors to determine if a toxic, anoxic, or explosive environment exists.

### **2.2 LINER SEAMING**

- A. If field seaming is required, then all seams and joints must be bonded by a qualified technician.

## **PART 3 - EXECUTION**

### **3.1 EXCAVATION AND HANDLING**

- A. Appropriate Personal Protection Equipment will be used to protect workers from work site hazards.
- B. Soil excavated with visible free product shall be contained and covered in accordance with the long term stockpile requirements of 18 AAC 75 Section 370.

**END OF SECTION**

**SECTION 02 80 10**  
**DECOMMISSION FUEL STORAGE TANKS AND PIPING**

**PART 1 - GENERAL**

**1.1 REQUIREMENTS INCLUDED**

- A. Procedures for Cleaning and Decommissioning Aboveground Fuel Storage Tanks.
- B. Procedures for containing tank contents.
- C. Procedures for Inspecting Aboveground Storage Tanks.

**1.2 RELATED REQUIREMENTS**

- A. Section 01 11 13 Work Covered by Contract Documents.
- B. Section 01 33 00 Submittals.
- C. Section 02 61 13 Excavation and Handling of Contaminated Material.

**1.3 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. API 2015 Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks.
- D. API 653 Tank Inspection, Repair, Alteration, and Reconstruction.
- E. 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
- F. 40 CFR Chapter I, Subchapter I – Solid Wastes, Parts 260 through 265
- G. 49 CFR Subtitle B, Chapter I, Subchapter A – Hazardous Materials and Oil Transportation, and Subchapter C – Hazardous Material Regulations

**1.4 SUBMITTALS**

- A. Health and Safety Plan which includes the Work Plan for decommissioning and

disposal of fuel storage tanks and piping as required by this Section and Section 01 11 13.

- B. Manifests for disposal of all RCRA and non-RCRA Hazardous Wastes.
- C. Test results from composite testing of the drums of sludge to determine sludge characterization.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. All tank sludge that test hazardous under 40 CFR Part 261 will be contained, stored transported and disposed of in accordance with all Federal, State and local Regulations, Statutes and Laws and the Specifications.

### **1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Containment liners and over-pack drums used for this project must withstand 80 mile per hour winds, petroleum emersion, direct sunlight, and -40° F temperatures.

### **1.7 DECOMMISSIONING AND DISPOSAL REQUIREMENTS**

- A. The existing fuel storage tanks and pipeline taken out of service as a result of this project shall be decommissioned by the Contractor. Photos are available upon request. See also Section 01 11 13 Work Covered by Contract Documents.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. All liners must meet 18 AAC Section 370 requirements.
- B. Over-pack drums for storing tank sludge must meet US DOT and US EPA requirements for transportation.
- C. Personal Protection Equipment must be appropriate for hazardous materials encountered on the work site and meet requirements in 29 CFR Subpart I, Sections 1910.132-1910.139.
- D. Equipment to Monitor Hazardous Atmosphere – The contractor shall use oxygen meters, combustible gas indicators, colorimetric indicator tubes, or organic vapor monitors to determine if a toxic, anoxic, or explosive environment exists.
- E. Contractor shall maintain a site-specific Health and Safety Plan that includes, but is not limited to:

1. List of key personnel.
2. Health and Safety Risk Analysis that meets 29 CFR Subpart I, Section 1910.120(c).
3. Comprehensive Work Plan.
4. Confined Space Entry Plan.
5. Site Control Measures.
6. Health and Safety Training Requirements.
7. Standard Operating Procedures.
8. Emergency Response Procedures.

### **PART 3 - EXECUTION**

#### **3.1 TANK DECOMMISSIONING AND DISPOSAL**

- A. The Contractor shall visually inspect all aboveground tanks designated for decommissioning. Contractor shall determine if product exists within each tank. If product exists, Contractor shall pump, filter, and transfer all useable product to the tank owners new tank(s) being constructed to replace the existing ones, or if the tank farm is not complete, to Contractor provided temporary storage. Contractor is responsible for all permits, coordination, and approvals associated with the transfer of fuel. Fuel transfer shall be in accordance with the most current version of the International Fire Code & Coast Guard Regulations. After all useable product and any accumulated water have been removed, Contractor shall measure the inside diameter of the tank and depth of sludge, if any. From these measurements, the approximate volume of sludge in each tank will be calculated.
- B. The Contractor shall clean the interior of each tank in accordance with API 2015 or other approved method.
- C. If sludge is removed from the tank, the Contractor shall place the sludge in an appropriate container and attach a label that contains the following information:
  1. Container Identification number.
  2. Tank ID#s.

3. Owner of tank.
  4. Date of Removal.
- D. The consolidation of sludge from tanks containing different products or owned by different entities will not be allowed without prior written approval of both Tank Owners. Should this occur without prior approval, the Contractor shall take immediate ownership of the combined waste and be fully responsible for all cost associated with the manifesting, transport and proper disposal of it.
- E. Appropriate Personal Protection Equipment will be used to protect workers from work site hazards.
- F. All tanks shall be rendered unusable by the Contractor at the time of decommissioning unless instructed by the Owner to salvage.

### **3.2 PIPE DECOMMISSIONING AND DISPOSAL**

- A. All fuel and residual liquid shall be completely removed from existing piping as follows, or by alternate means and method submitted by the Contractor. If alternate means and methods will be used by the Contractor this shall be described in the Work Plan required by this section.
1. Piping 2-inch nominal diameter and smaller: Remove fuel by disconnecting each end of the piping system and blowing fuel out of the pipe with a compressed gas. The velocity of the compressed gas in the pipe shall be sufficient to remove essentially all residual liquid from the pipe.
  2. Piping larger than 2-inch nominal diameter: Remove fuel by disconnecting each end of the piping system and propelling a foam pig through the pipeline at a sufficient velocity to remove essentially all remaining liquid. Pig shall be propelled by a compressed gas. At least three (3) pigs shall be propelled through each pipe segment.
- B. The Contractor shall contain, filter and transfer all useable fuel removed from piping to the respective entities tanks. Any unusable fuel or sludge shall be assumed to be hazardous waste and disposed of by the Contractor in accordance with this Specification.
- C. After fuel is removed from the piping, all above grade pipe shall be cut into maximum 10 foot lengths and transported to the Contractor provided final disposal site or other approved location. Below grade piping shall be capped and abandoned in place or removed as required to install new below grade piping.

**3.3 HAZARDOUS WASTES**

- A. The hazardous nature of containerized sludge will be based upon composite testing performed by the Contractor in accordance with 40 CFR 261.
- B. All waste that is deemed hazardous in accordance with 40 CFR 261 shall be manifested in accordance with 40 CFR 262 and shipped in accordance with US DOT 49 CFR parts 100-199 regulations. The Contractor shall use EPA Uniform Hazardous Waste Manifest, OMB No. 2050-0039, EPA form 8700-22.

**END OF SECTION**

**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

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

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.
- D. Material test reports.

**1.3 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Pre-installation Conference: Conduct conference at Project site.

**PART 2 - PRODUCTS**

**2.1 FORM-FACING MATERIALS**

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

**2.2 REINFORCEMENT**

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement

in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

### **2.3 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or II.
- B. Aggregates: All aggregates shall be provided from an approved source.
  - 1. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch nominal maximum coarse-aggregate size.
  - 2. Fine Aggregate: ASTM C 33, Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260. BASF MB-AE 90 or approved equal.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A. BASF PS-1466 or approved equal

### **2.4 CURING MATERIALS**

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap polyethylene sheet.
- C. Water: Potable.

### **2.5 CONCRETE MIXTURES**

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 3,500 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Slump Limit: 4 inches, plus or minus 1 inch.
  - 4. Air-entrainment is required for all concrete and shall be 6 percent +/- 1-1/2 percent.

### **2.6 FABRICATING REINFORCEMENT**

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

## **2.7 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M.

## **PART 3 - EXECUTION**

### **3.1 FORMWORK**

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

### **3.2 EMBEDDED ITEMS**

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- B. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

### **3.3 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. Deposit concrete continuously in one layer or in horizontal layers of such thickness 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

### **3.4 CONCRETE FINISHING**

- A. General: Comply with ACI 302.1R recommendations for screening, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down

high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

- C. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- D. Exposed Formed Concrete Vertical Surfaces: Smooth rubbed finish.
- E. Concrete Top Surfaces: Broom finish.

### **3.5 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.
- B. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

### **3.6 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.

### **3.7 FIELD QUALITY CONTROL**

- A. Testing and Inspecting: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Tests shall be performed according to ACI 301 and the Design Drawings.

**END OF SECTION**

**SECTION 05 12 10**  
**STRUCTURAL STEEL FRAMING AND FABRICATIONS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Structural steel framing members and support members.
- B. Plates and fabricated connections.

**1.2 WORK INCLUDED**

- A. This section includes fabrication and erection of structural steel work as shown on the Drawings.
  - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) “Code of Standard Practice” and as otherwise shown on Drawings.
  - 2. This section applies, but is not limited to, steel floor structure, foundation beams and supports, stairways, landings, handrails, support platforms, and other miscellaneous steel fabrications.

**1.3 RELATED REQUIREMENTS**

- A. Section 06 10 00 - Rough Carpentry
- B. Section 07 21 00 - Thermal Insulation
- C. Section 09 91 00 – Painting

**1.4 REFERENCE STANDARDS**

- A. AISC (MAN) – Steel Construction Manual; American Institute of Steel Construction, Inc.
- B. AISC S303 – Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.
- C. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
- D. ASTM 53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
- F. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- H. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.

- I. ASTM A572 /A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- J. ASTM A992/A992M – Standard Specification for Structural Steel Shapes.
- K. ASTM F436 – Standard Specification for Hardened Steel Washers.
- L. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.
- M. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.
- N. AWS D1.1/D1.1M – Structural Welding Code – Steel; American Welding Society.

### **1.5 SUBMITTALS**

- A. Product data or manufacturer’s specifications and installation instructions for products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
- B. Shop Drawings:
  - 1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
  - 2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis, and non-destructive test analysis.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

### **1.6 QUALITY ASSURANCE**

- A. Fabricate structural steel members in accordance with AISC “Steel Construction Manual”.
- 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.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Fabricate or 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.
- C. Do not store materials 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 – PRODUCTS**

### **2.1 MATERIALS**

- 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. Steel Shapes: ASTM A36/A36M.
- C. Steel Plate: ASTM A36/A36M.
- D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- E. Pipe: ASTM A53/A53M, Grade B, Finish black.
- F. Electrodes for Welding: Comply with AWS Code.
- G. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or A563M nuts and ASTM F436 washers.

### **2.2 FABRICATION**

- A. Shop fabricate to greatest extent possible.
- B. 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.
- C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

- D. Fabricate connections for bolt, nut, and washer connectors.
- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Assemble and weld built up sections by methods that will produce true alignment of axes without warp.
- G. 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.
- H. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- I. Tolerances: Structural component tolerances shall be +/- 1/8 inch and as required to adequately support loads.

### **2.3 STEEL COATING**

- A. The steel members and fabrications shall be coated in accordance with the Drawings and Specifications.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.
- B. 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.
- C. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the Work.
  - 1. Promptly notify Project Manager whenever design of members and connections for any portion of structure are not clearly indicated.

### **3.2 ERECTION**

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
- B. Temporary Shoring and Bracing: Allow for erection loads, and 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.

- C. Shop Welding: Contractor shall 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.
- D. 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.
- E. Level and plumb individual members of structure within specified AISC tolerances.
- F. 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 the Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.
- G. Touch-Up Repairs: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint or galvanizing.
- H. Coating Repair: If underlying metal surface is exposed, wheel abrade or sandblast to clean metal and re-coat same as original fabrication. If damage does not fully penetrate coating then reapply top coat only to minimum DFT.
- I. Field weld components indicated on shop drawings.
- J. Do not field cut or alter structural members without approval of Engineer.

### **3.3 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

### **3.4 FIELD QUALITY CONTROL**

- A. The Authority, or Authority's representatives, will visually inspect welded connections.
- B. The Authority reserves the right to contract an independent testing firm to test welded connections.
- C. Provide access for the Authority's inspectors or testing agency representatives to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. The Authority 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: Contractor shall 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.
- G. Field Welding: Contractor shall 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.

**END OF SECTION**

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Wood furring, grounds, nailers, and blocking.
  - 3. Sheathing.
  - 4. Roof Underlayment.
  - 5. Fasteners and metal framing anchors.

**1.2 RELATED REQUIREMENTS**

- A. Section 05 12 10 – Structural Steel Framing and Fabrications
- B. Section 06 17 53 - Shop Fabricated Trusses
- C. Section 07 21 00 - Thermal Insulation

**1.3 REFERENCES**

- A. American Forest and Paper Association (AFPA) Manual for Wood Frame Construction
- B. Engineered Wood Association  
Form E30 Engineered Wood Design/Construction Guide
- C. American Society of Mechanical Engineers (ASME)
  - B18.2.1 Square and Hex Bolts and Screws (Inch Series)
  - B18.6.1 Wood Screws (Inch Series)
- D. American Society for Testing and Materials (ASTM)
  - A153 Specification for Zinc-Coating (Hot-Dip of Iron and Steel Hardware)
  - A307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
  - A563 Specification for Carbon and Alloy Steel Nuts
  - A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - D245 Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber
  - D2555 Test Method for Establishing Clear Wood Strength Values
- E. American Wood Preservers Association (AWPA)

- C2 Lumber, Pressure Treatment
- M4 Standard for the Care of Preservative-Treated Wood Products
- F. Federal Specification (FS)
  - FF-N-105B Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
- G. International Conference of Building Officials (ICBO)
  - International Building Code (IBC) Chapter 23 Wood
- H. U.S. Department of Commerce, National Institute of Standards and Technology
  - PS 1 US Product Standard for Construction and Industrial Plywood
  - PS 2 Performance Standard for Wood-Based Structural-Use Panels
  - PS 20 American Softwood Lumber Standard (ASLS)

#### **1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data for each distinct product specified.
- B. Wood treatment data as follows, including chemical treatment manufacturer's warranty and instructions for handling, storing, installing, and finishing treated materials:
  - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wood products bundled or crated to provide adequate protection during transit and job storage, with required grade marks clearly identifiable. Inspect wood products for damage upon delivery. Remove and replace damaged materials.
- B. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks, and under temporary coverings.
- C. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- D. Protect sheet materials during handling to prevent breaking of corners and damage to surfaces.

## **PART 2 – PRODUCTS**

### **2.1 LUMBER, GENERAL**

- A. Lumber Standards: Comply with PS 20-99, “American Softwood Lumber Standard,” and with applicable grading rules of inspection agencies certified by ALSC’s Board of Review. Lumber design values are to comply with ASTM D245 and ASTM D2555.
- B. Inspection Agencies: Inspection agencies, and their grading rules include the following:
  - 1. West Coast Lumber Inspection Bureau (WCLIB)  
No. 17 Standard Grading Rules for West Coast Lumber
  - 2. Western Wood Products Association (WWPA)  
Western Lumber Grading Rules
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.  
  
For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
- D. Where nominal sizes are indicated, provide actual sizes required by PS 20-99 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 1. Provide dressed lumber, surfaced four sides (S4S), unless otherwise indicated.
  - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38 mm actual) thickness or less, unless otherwise indicated.

### **2.2 WOOD-PRESERVATIVE-TREATED MATERIALS**

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with Quality Mark Requirements of inspection agency approved by ALSC’s Board of Review.
- B. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- C. Pressure treat aboveground items with waterborne preservatives to minimum retention of 0.25 lb./cu. ft. (4.0 kg/cu. m.). After treatment, kiln-dry lumber and plywood to maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood indicated on Drawings as treated.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  3. Wood framing members less than 18 inches (460 mm) above grade.
  4. Wood floor plates installed over concrete slabs, steel floors, or directly in contact with earth.
- D. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to minimum retention of 0.60 lb./cu. ft.
- E. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

### **2.3 DIMENSION LUMBER**

- A. All lumber to equal No. 2 Douglas Fir, or better.

### **2.4 MISCELLANEOUS LUMBER**

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on Contract documents.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade and Species: For dimension lumber sizes, provide No. 2, or better Douglas Fir.

### **2.5 SHEATHING**

- A. Exterior rated Type PS-1 structural plywood of the thickness indicated.

### **2.6 ROOF UNDERLAYMENT**

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick. Grace Ice and Water Shield, or approved equal.

### **2.7 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
- B. Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners with hot-dip, zinc-coating per ASTM A153
- C. Nails, Wire, Brads, and Staples: ASTM F1667
- D. Wood Screws: ASME B18.6.1.

- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A with ASTM A563 hex nuts and, where indicated, flat washers.

## **2.8 METAL FRAMING ANCHORS**

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated, with allowable design loads as published by manufacturer, that meet or exceed those indicated.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with IBC Table 2304.9.1 Fastening Schedule.

### **3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS**

- A. Install wood grounds, nailers, blocking, and sleepers where shown, and where required for attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

### **3.3 WOOD FURRING**

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Firestop furred spaces of walls at each floor level, and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

### **3.4 WOOD FRAMING, GENERAL**

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Install framing members of size and at spacing indicated.
- C. Do not splice structural members between supports.

- D. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal (38 mm actual) thickness lumber of same width as framing members.
- E. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel.
- F. Provide single bottom plate and double top plates using members of 2-inch nominal (38 mm actual) thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.
- G. Construct corners and intersections with three (3) or more studs. Provide miscellaneous blocking and framing as shown, and as required to support facing materials, fixtures, specialty items, and trim.
- H. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs. For load-bearing walls, provide double-jamb studs for openings 72 inches (1.8 m) and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown as indicated on Drawings.

**END OF SECTION**

**SECTION 06 17 53**  
**SHOP-FABRICATED WOOD TRUSSES**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes wood roof trusses.

**1.2 RELATED REQUIREMENTS**

- A. Section 05 12 10 – Structural Steel Framing and Fabrications  
B. Section 06 10 00 - Rough Carpentry

**1.3 SUBMITTALS**

- A. Product Data: Metal plate connectors, metal-truss accessories, and fasteners.  
B. Shop Drawings: Show fabrication and installation details for trusses.
1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  2. Indicate sizes, stress grades, and species of lumber.
  3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  4. Indicate locations, sized, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
  5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  6. Show splice details and bearing details.
  7. Indicate compliance with performance requirements and design criteria as indicated on the Drawings.
  8. Including analysis data signed and sealed by an engineer licensed to practice in the State of Alaska.

**1.4 QUALITY ASSURANCE**

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in PTI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect

and authorities having jurisdiction.

- C. Engineering Qualifications: Shop drawings to be signed and sealed by an engineer licensed to practice in the State of Alaska.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, “Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses”.

## **PART 2 – PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Trusses shall be designed for the gravity loads, wind and seismic lateral and uplift loads, and support conditions as indicated on the Drawings and Specifications. No duration of load increase in stresses will be allowed for snow loading. Unbalanced snow and drift loading is required.
- B. Wood truss design criteria shall be in accordance with the 2012 International Building Code and ASCE/SEI 7-10 “Minimum Design Loads for Buildings and Other Structures”. Design shall use the parameters listed on the Drawings.
  - 1. Trusses shall be designed, or supplemented, for anticipated shipping and handling loads.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA’s “National Design Specifications for Wood Construction” and it’s “Supplement”.

### **2.2 GENERAL REQUIREMENTS**

- A. Dimension Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Provide dressed lumber, S4S, unless otherwise indicated.
  - 3. Species: Hem or Douglas Fir, unless otherwise indicated.
  - 4. Grade No. 2 or better.

### **2.3 METAL CONNECTOR PLATES**

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B), G60 coating designation; and not less than 0.036 inches

thick.

## **2.4 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  - 2. Where trusses are exposed to weather, in ground contact, or in an area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153 M.
- B. Nails, Brads, and Staples: ASTM F 1667.

## **2.5 METAL FRAMING ANCHORS AND ACCESSORIES**

- A. Allowable design loads, as published by manufacturer, shall comply with or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand the same loads as the anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

## **2.6 FABRICATION**

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or by hydraulic press.

# **PART 3 – EXECUTION**

## **3.1 INSTALLATION – GENERAL**

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI 1 recommendation and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing

anchors according to manufacturer's fastening schedules and written instructions.

- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

**END OF SECTION**

**SECTION 07 21 00**  
**THERMAL INSULATION**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Polystyrene foam-plastic board.
- B. Fiberglass batt or blanket.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-In-Place Concrete
- B. Section 05 12 10 - Structural Steel Framing and Fabrications
- C. Section 06 10 00 - Rough Carpentry
- D. Section 31 23 00 - Excavation and Fill
- E. Section 31 23 33 - Trenching and Backfill For Utilities.
- F. Section 33 61 14 - PEX Arctic Pipe

**1.3 SUBMITTALS**

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

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Do not expose foam-plastic board to sunlight except to necessary extent for period of installation and concealment.

**PART 2 – PRODUCTS**

**2.1 POLYSTYRENE FOAM-PLASTIC BOARD**

- A. Insulation Board: Extruded polystyrene rigid insulation. Maximum water absorption shall not exceed 0.3% by volume, as determined in ASTM C272. Thermal resistance (R-value) shall not be less than 4.5 per inch at 75°F as determined by ASTM C177. The minimum board size shall be 2-inches by 2-feet by 8-feet. Compressive strength at yield or 10% deformation shall not be less than 40 PSI. Dow Styrofoam Hi-40 or approved equal.

**2.2 FIBERGLASS BATT**

- A. Blanket/Batt Insulation: Roll or batt type blanket insulation, fiberglass or mineral wool. Minimum R value 13 for 3-1/2" thickness and 19 for 6-1/2" thickness.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF INSULATION BOARD**

- A. Prior to placing the insulation board, blade, shape, and compact subgrade to a flat, smooth, firm, and unyielding surface. Visually inspect embankment surface and remove bumps, ruts, deleterious material, debris, and any other objects that may prevent proper installation, attachment, and performance of the insulation board.
- B. Place a sand bedding leveling course at least two (2) inches thick on the subgrade.
- C. Set each board accurately to the line and grade established and anchor firmly in place.
- D. Do not compact fill over insulation until it is completely thawed through its entire thickness.
- E. Use caution and appropriate construction techniques to ensure the insulation is protected and not damaged during formation of embankments.
- F. Remove and replace, at no cost to the Authority, any insulation that has been damaged or displaced.

#### **3.2 INSTALLATION OF FIBERGLASS BATT**

- A. Completely fill spaces to create a complete and unbroken thermal envelope around the building interior.
- B. Prior to covering, ensure that all insulation is secure so that it will not settle and create voids.
- C. Install a minimum 6 mil polyethylene sheet vapor barrier over all interior surfaces. Tape all seams and joints.

**END OF SECTION**

**SECTION 07 41 13**  
**FORMED METAL ROOF PANELS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal roof panels.
- B. Flashing and trim integral to roof panels.
- C. Clips, anchoring devices, fasteners, and accessories for installation of panel system.
- D. Snow fence system.

**1.2 SUBMITTALS**

- A. Product Data: Metal panels, fasteners, sealants, accessories, and snow fence components.
- B. Shop Drawings:
  - 1. Calculations demonstrating compliance with performance requirements and design criteria as indicated on the Drawings.
  - 2. Panel layout and lengths.
  - 3. Fastening requirements by zone
  - 4. Trim, flashing, sealant, and other details of installation.
- C. Manufacturer's installation instructions.

**1.3 REFERENCE STANDARDS**

- A. UL 580 - Uplift Resistance of Roof Assemblies.
- B. UL 1897 - Uplift Test for Roof Covering Systems.
- C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A 792 - Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process.
- E. ASTM A 924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Structural and Wind Load Tests:
  - 1. Design load/deflection criteria verified from tests per ASTM E 72 "Chamber Method" using a 20 psf (0.96 kPa) simulated wind load with a deflection limit of L/240.
  - 2. FM Approval Standard 4471: Meets windstorm Class 1A [90] and hailstorm Class 1-SH classifications.

3. Underwriters Laboratory (UL) Uplift Tests for Roof Assemblies: UL Class 90 rated in accordance with UL 580 and shall withstand static uplift load of 140 psf when tested on 7 foot purlin spacing and 166 psf when tested on 5-foot purlin spacing.

## **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five years documented experience.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with Manufacturer's written instructions. Store under cover in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.
- C. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.

## **1.7 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer's two year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty. Warranty does not include interior painted surface of panels.
- B. Submit exterior paint manufacturer's written twenty year limited warranty on paint finish for adhesion to the substrate and a thirty year limited warranty on chalk and color fade.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: AEP Span or approved equal.

### **2.2 MATERIALS**

- A. Standing Seam Metal Roof Panels: AEP Span Design Span HP or approved equal.
  1. Prefinished Galvalume® or Zinalume® sheet, ASTM AZ50 made of 55% aluminum, 1.6% silicon and the balance zinc as described in ASTM specification A792.
  2. Fabricated panel with integral continuous snap together seams.
  3. Seam Height: 1-7/8” high ribs @ 16” centers.
  4. Provide pre-installed sealant within the confines of panel’s female leg designed to seal against adjacent male panel leg.

5. Minimum Thickness: 24 gauge (0.0250 inch) or as indicated on Drawings.
- B. Panel Finish: One coat 70 percent polyvinylidene fluoride, nominal 0.7 mil (0.02 mm) thick, over 0.2 mil (0.005 mm) primer. Color as indicated on Drawings.
- C. Flashing and Trim: Brake-formed sheet metal in the same thickness and finish to match the panels.
- D. Fasteners: Clips, anchoring devices, fasteners, and accessories for installation of panel system as recommended by panel manufacturer for the system specified.
- E. Sealant: Sealant as recommended by panel manufacturer.

### **2.3 SNOW FENCE**

- A. Provide snow fence system as shown on the Drawings. The snow fence shall be a complete system that is compatible with the roof panels and is engineered for the application.
- B. The number of rows indicated on the Drawings is the minimum quantity. If the calculations indicate more, provide additional rows as required. If the calculations indicate less, provide the minimum quantity shown on the Drawings. Install first row 12" above the eave and second row 12" above the bearing wall.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine structural members before beginning installation to ensure that all supporting members are straight, level, plumb and satisfactory for panel installation.
- B. Panel Support Tolerances:
  1. Overall rake to rake tolerances plus or minus 2 inches or plus or minus 1 inch at each rake.
  2. Overall eave to ridge tolerance plus or minus 1 inch or plus or minus 1/2 inch at the eave, end lap and ridge.
  3. Vertical deviation from the nominal roof plane of plus or minus 1/8 inch in any 5 foot length, plus or minus 1/4 inch in any 20 foot length and plus or minus 1/2 inch over the entire roof area.
- C. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.
- D. Correct defective conditions before beginning work.
- E. If substrate is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

### **3.2 UNDERLAYMENT INSTALLATION**

- A. Provide continuous underlayment in accordance with the Drawings and Specifications. Comply with temperature restrictions of underlayment manufacturer

for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

### **3.3 INSTALLATION GENERAL**

- A. Install in accordance with manufacturer's instructions and recommendations including approved shop drawings, installation guidebook and manufacturer's handbook of construction details.
- B. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations and calculations for design wind load criteria.
- C. Install flashing and trim true and in proper alignment.
- D. Protective film on trim shall be removed before exposure to sunlight.
- E. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tight

### **3.4 CLEANING**

- A. Replace damaged panels and other components of work, which cannot be repaired by finish touch-up or similar minor repair.
- B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

### **3.5 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 07 42 13**  
**FORMED METAL WALL PANELS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal wall panels.
- B. Flashing and trim integral to wall panels.
- C. Fasteners and accessories for installation of panel system.

**1.2 SUBMITTALS**

- A. Product Data: Metal panels, fasteners, sealants, and accessories.
- B. Shop Drawings:
  - 1. Calculations demonstrating compliance with performance requirements and design criteria as indicated on the Drawings.
  - 2. Panel layout and lengths.
  - 3. Fastening requirements by zone
  - 4. Trim, flashing, sealant, and other details of installation.
- C. Manufacturer's installation instructions.

**1.3 REFERENCE STANDARDS**

- A. UL 580 - Uplift Resistance of Roof Assemblies.
- B. UL 1897 - Uplift Test for Roof Covering Systems.
- C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A 792 - Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process.
- E. ASTM A 924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Structural and Wind Load Tests:
  - 1. Design load/deflection criteria verified from tests per ASTM E 72 "Chamber Method" using a 20 psf (0.96 kPa) simulated wind load with a deflection limit of L/240.
  - 2. FM Approval Standard 4471: Meets windstorm Class 1A [90] and hailstorm Class 1-SH classifications.
  - 3. Underwriters Laboratory (UL) Uplift Tests for Roof Assemblies: UL Class 90 rated in accordance with UL 580 and shall withstand static uplift load of 140 psf when tested on 7-foot purlin spacing, and 166 psf when tested on

5-foot purlin spacing.

### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five years documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with Manufacturer's written instructions. Store under cover in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.
- C. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.

### **1.7 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer's two-year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty. Warranty does not include interior painted surface of panels.
- B. Submit exterior paint manufacturer's written twenty-year limited warranty on paint finish for adhesion to the substrate and a thirty-year limited warranty on chalk and color fade.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: AEP Span or approved equal.

### **2.2 MATERIALS**

- A. Metal Wall Panels: AEP Span PBR, or approved equal.
  - 1. Prefinished Galvalume® or Zinalume® sheet, ASTM AZ50 made of 55% aluminum, 1.6% silicon and the balance zinc as described in ASTM specification A792.
  - 2. Fabricate panels with sufficient thickness to meet specified UL 90 wind uplift requirements.
  - 3. Fabricated panel with integral continuous overlapping seams.
  - 4. Seam Height: 1-1/4” high ribs at 12” centers with 1/4” high minor ribs at 4” centers.
  - 5. Minimum Thickness: 24 gauge (0.0250 inch) or as indicated on Drawings.
- B. Panel Finish: One coat 70 percent polyvinylidene fluoride, nominal 0.7 mil (0.02

mm) thick, over 0.2 mil (0.005 mm) primer. Color as indicated on Drawings.

- C. Flashing and Trim: Brake-formed sheet metal in the same thickness and finish to match the panels.
- D. Fasteners: Fasteners and accessories for installation of panel system as recommended by panel manufacturer for the system specified.
- E. Sealant: Sealant as recommended by panel manufacturer.

### **PART 3 – EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine structural members before beginning installation to ensure that all supporting members are straight, level, plumb and satisfactory for panel installation.
- B. Panel Support Tolerances:
  - 1. Overall rake to rake tolerances plus or minus 2 inches or plus or minus 1 inch at each rake.
  - 2. Vertical deviation from the nominal wall plane of plus or minus 1/8 inch in any 5 foot length, plus or minus 1/4 inch in any 20 foot length and plus or minus 1/2 inch over the entire wall area.
- C. Verify wall openings, curbs, pipes, sleeves, ducts, or vents through wall are solidly set, reglets are in place, and nailing strips located.
- D. Correct defective conditions before beginning Work.
- E. If substrate is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **3.2 INSTALLATION – GENERAL**

- A. Install in accordance with manufacturer's instructions and recommendations including approved shop drawings, installation guidebook and manufacturer's handbook of construction details.
- B. Anchor securely in place using fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
- C. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.
- D. Install flashing and trim true and in proper alignment.
- E. Protective film on trim shall be removed before exposure to sunlight.
- F. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tight

#### **3.3 CLEANING**

- A. Replace damaged panels and other components of work, which cannot be repaired by

finish touch-up or similar minor repair.

- B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

### **3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 07 43 13**  
**FORMED VENTED SOFFIT PANELS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal soffit panels.
- B. Flashing and trim integral to soffit panels.
- C. Fasteners and accessories for installation of panel system.

**1.2 SUBMITTALS**

- A. Product Data: Metal panels, fasteners, sealants, and accessories.
- B. Shop Drawings:
  - 1. Panel layout and lengths.
  - 2. Trim, flashing, sealant, and other details of installation.
- C. Manufacturer's installation instructions.

**1.3 REFERENCE STANDARDS**

- A. UL 580 – Uplift Resistance of Roof Assemblies.
- B. UL 1897 – Uplift Test for Roof Covering Systems.
- C. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A 792 – Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process.
- E. ASTM A 924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Structural and Wind Load Tests:
  - 1. Design load/deflection criteria verified from tests per ASTM E 72 "Chamber Method" using a 20 psf (0.96 kPa) simulated wind load with a deflection limit of L/240.
  - 2. FM Approval Standard 4471: Meets windstorm Class 1A [90] and hailstorm Class 1-SH classifications.
  - 3. Underwriters Laboratory (UL) Uplift Tests for Roof Assemblies: UL Class 90 rated in accordance with UL 580 and shall withstand static uplift load of 140 psf when tested on 7-foot purlin spacing and 166 psf when tested on 5-foot purlin spacing.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five years documented experience.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with Manufacturer's written instructions. Store under cover in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.
- C. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.

## **1.7 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer's two-year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty. Warranty does not include interior painted surface of panels.
- B. Submit exterior paint manufacturer's written twenty-year limited warranty on paint finish for adhesion to the substrate, and a thirty-year limited warranty on chalk and color fade.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: AEP Span or approved equal.

### **2.2 MATERIALS**

- A. Metal Soffit Panels: AEP Vented Flush-Panel or approved equal.
  - 1. Prefinished Galvalume® or Zincolume® sheet, ASTM AZ50 made of 55% aluminum, 1.6% silicon and the balance zinc as described in ASTM specification A792.
  - 2. Fabricate panels with sufficient thickness to meet specified UL 90 wind uplift requirements.
  - 3. 1" Standoff from Substrate.
  - 4. Thickness: 24 gauge (0.0250 inch).
  - 5. Two pencil ribs.
  - 6. Provide 7.8% Net Free Area.
  - 7. Concealed Fasteners.
  - 8. 12" Net Coverage.

- B. Panel Finish: One coat 70 percent polyvinylidene fluoride, nominal 0.7 mil (0.02 mm) thick, over 0.2 mil (0.005 mm) primer. Color as indicated on Drawings.
- C. Flashing and Trim: Brake-formed sheet metal in the same thickness and finish to match the panels.
- D. Fasteners: Fasteners and accessories for installation of panel system as recommended by panel manufacturer for the system specified.
- E. Sealant: Sealant as recommended by panel manufacturer.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine structural members before beginning installation to ensure that all supporting members are straight, level, plumb and satisfactory for panel installation.
- B. Panel Support Tolerances:
  - 1. Overall rake to rake tolerances plus or minus 2 inches, or plus or minus 1 inch at each rake.
  - 2. Vertical deviation from the nominal wall plane of plus or minus 1/8 inch in any 5 foot length, plus or minus 1/4 inch in any 20 foot length, and plus or minus 1/2 inch over the entire wall area.
- C. Verify wall openings, curbs, pipes, sleeves, ducts, or vents through wall are solidly set, reglets are in place, and nailing strips located.
- D. Correct defective conditions before beginning work.
- E. If substrate is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 INSTALLATION – GENERAL**

- A. Install in accordance with manufacturer's instructions and recommendations including approved shop drawings, installation guidebook and manufacturer's handbook of construction details.
- B. Anchor securely in place using fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
- C. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.
- D. Install flashing and trim true and in proper alignment.
- E. Protective film on trim shall be removed before exposure to sunlight.
- F. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tight.

**3.3 CLEANING**

- A. Replace damaged panels and other components of work, which cannot be repaired by finish touch-up or similar minor repair.
- B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

**3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

## **SECTION 07 43 22**

### **INSULATED METAL WALL PANELS (UNDERFLOOR)**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Insulated metal wall panels.
- B. Flashing and trim integral to insulated panels.
- C. Clips, anchoring devices, fasteners, and accessories for installation of panel system.

##### **1.2 SUBMITTALS**

- A. Product Data: Insulated metal panels, fasteners, sealants, and accessories.
- B. Manufacturer's installation instructions.

##### **1.3 REFERENCES**

- A. NFPA 259 - Test Method for Potential Heat of Building Materials
- B. NFPA 285 - Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies
- C. NFPA 286 - Fire Test of Evaluating Conditions of Wall and Ceiling Finish to Roof Fire Growth
- D. AAMA 501.1 - Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
- E. Factory Mutual Research Corporation (FMRC) Standard 4880 - Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, and Interior or Exterior Finish Systems.
- F. Factory Mutual Research Corporation (FMRC) Standard 4881 - Standard for Class Exterior Wall Systems.
- G. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A 792 - Standard Specification for Steel Sheet, Aluminum-Zinc Alloy Coated Steel by the Hot-Dip Process
- I. ASTM A 924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- J. ASTM C 273 - Shear Properties of Sandwich Core Materials
- K. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- L. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics

- M. ASTM D 1622 - Apparent Density of Rigid Cellular Plastics
- N. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
- O. ASTM E 18 - Test Methods for Rockwell Hardness of Metallic Finishes
- P. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- Q. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- R. ASTM E 90-99 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- S. ASTM E 283 - Standard Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- T. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- U. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- V. ASTM E 413-87 - Classification of Rating Sound Insulation
- W. ASTM E 1332-10a - Classification for Rating Outdoor-Indoor Sound Attenuation
- X. ASTM E 1592 - Structural Performance of Metal Roofing and Siding Systems by Uniform Static Air Pressure Difference
- Y. ASTM E 1996 - Test Method for Performance of Exterior Impact Protective Systems by Windborne Debris in Hurricanes, 15 pound
- Z. ASTM F 1642 - Standard Test Method for Glazing and Glazing Systems subject to Airblast Loading
- AA. CAN 4-S101 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- BB. CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- CC. CAN/ULC S126 - Standard Method of Test for Fire Spread Under Roof-Deck Assembly.
- DD. CAN/ULC S134 - Fire Test of Exterior Wall Assemblies
- EE. CAN/ULC S138 - Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration
- FF. US Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED) Green Building Rating System.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Structural and Wind load Tests:
  - 1. Design load/deflection criteria verified from tests per ASTM E 72 "Chamber Method" using a 20 psf (0.96 kPa) simulated wind load with a deflection limit of L/180 for exterior wall panels, L/120 for partition and liner walls and L/240 for ceiling panels.
  - 2. Meet I.B.C. criteria based on 13121, 1.06 design requirements.
- B. Thermal Performance:
  - 1. When tested in accordance with ASTM C 518, "measurement of steady state thermal transmission", the panels shall provide a K-factor of 0.14 btu/sf/hr./deg. F at a 75 degrees F (24 degrees C) mean temperature.
- C. Vapor Barrier:
  - 1. Air Infiltration: Air infiltration shall not exceed 0.06 cfm per square foot of wall area when tested in accordance with ASTM E 283 at a static pressure of 12 psf (0.576 kPa)
  - 2. Static Water Penetration: No uncontrolled water penetration through the panel joints at a static pressure of 20 psf (0.96 kPa) when tested in accordance with ASTM E 331.
  - 3. Dynamic Water Penetration: No uncontrolled water penetration through panel joints when subjected to a 95 mph (153 kph) slip stream air flow and application of water for a 15 minute period in accordance with AAMA501.1.
  - 4. Condensation Resistance Factor: Minimum condensation resistance factor of the panel shall be 92 when tested in general accordance with AAMA 1503.1.
- D. Fire:
  - 1. Panels shall be fabricated and installed so that no thermal barrier is required in accordance with IBC Section 2603.9, Special Approval.
  - 2. Surface Burning Characteristics: Insulated core shall have been tested in accordance with ASTM E 84 for surface burning characteristics. The core shall have a maximum flame spread of 25 and a smoke developed rating of 450.
  - 3. National Fire Protection Association - Fire Propagation: Fire assembly shall meet the requirements of NFPA 285 Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies and NFPA 286 Fire Tests for Evaluating Contribution of Wall and Ceiling Finish to Roof Fire Growth. Heat potential shall be determined using NFPA 259 Test Method for Potential Heat of Building Materials.
  - 4. IBC Chapter 26: Panel performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.

- E. Bond Strength:
1. Fatigue Test: Panel shall withstand deflection cycling at L/180 to two million alternate cycles with no evidence of delamination, core cracking or permanent bowing.
  2. Freeze/Heat Cycling: Panel shall exhibit no delamination, surface blistering or permanent bowing when subjected to cyclic temperature extremes of minus 20 degrees F (minus 28 degrees C) to plus 180 degrees F (plus 82 degrees C) for twenty-one eight hour cycles.
  3. Humidity Test: Panel shall exhibit no delamination or metal corrosion at interface when subjected to a 140 degree F (60 degree C) temperature and 100 percent relative humidity for a total of 1200 hours.
  4. Autoclave Test: Panel shall exhibit no delamination of the foam core from metal skins when exposed to 2 psi (0.122 kg/sq. cm) pressure at a temperature of 212 degrees F (100 degrees C) for a total of 2-1/2 hours.

## **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing factory foamed in place insulated metal panels with a minimum documented experience of ten years.
- B. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five years documented experience.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with Manufacturer's written instructions. Store under cover in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Shield foam insulated metal roof panels from direct sunlight until installation
- C. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.
- D. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed installations.

## **1.08 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer's two year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty.
- B. Submit exterior coating manufacturer's written forty year limited warranty on paint finish for adhesion to the substrate and a thirty year limited warranty on chalk and color fade.

## **PART 2 – PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Metl-Span LLC, which is located at: 1720 Lakepointe Dr. Suite 101; Lewisville, TX 75057-6425; Toll Free Tel: 877-585-9969; Tel: 972-221-6656; Fax: 972-420-9382; Email: request info (infor@metlspan.com); Web: [www.metlspan.com](http://www.metlspan.com); or approved equal.

### **2.02 MATERIALS**

- A. Insulated Metal Wall Panels: Metl-Span Santa Fe Insulated Metal Wall Panel, roll-formed exterior and interior steel sheet faces chemically bonded to continuously foamed-in-place insulated core; laminated panels are not acceptable. Provide Architectural concealed fastener system.
- B. Exterior Face:
1. Stucco Embossed Flat Wall Panel
  2. Material: G-90 galvanized steel conforming to ASTM A 653 or, at the manufacturer's discretion, AZ-50 aluminum-zinc coated steel conforming to ASTM A-792, minimum grade 33, with a stucco embossed texture.
  3. Thickness: 24 gauge (0.0250 inch).
- C. Interior Faces:
1. Light Mesa profiled liner.
  2. Material: G-90 galvanized steel conforming to ASTM A 653 or, at the manufacturer's discretion, AZ-50 aluminum-zinc coated steel conforming to ASTM A-792, minimum grade 33, with a stucco embossed texture.
  3. Thickness: 24 gauge (0.0250 inch).
- D. Panel Width: Minimum 36 inches.
- E. Panel Thickness: 2 inches
- F. Foam Core: Continuously foamed-in-place, zero ODP and zero VOC closed cell polyurethane, Factory Mutual Class 1 approval.
- G. Thermal Value: K-factor, Btu in/ft<sup>2</sup> hr degrees F @ 75 degrees F mean core temperature = 0.140.
- H. Side Connection Joints: Offset double tongue and groove joinery with an extended metal shelf allowing fasteners to penetrate both metal faces with clips concealed in the side joint.
- I. Panel Finish:
1. Exterior Finish: One coat, factory applied, 70 percent polyvinylidene fluoride, nominal 0.7 mil (0.02 mm) thick, over 0.2 mil (0.005 mm) primer; color per Specification Section 13121, 1.04, B.

2. Interior Finish: One coat, factory applied coil coating, nominal 0.7 mil (0.02 mm) thick, over 0.2 mil (0.005 mm) primer; color per Specification Section 13121, 1.04, B.
- J. Flashing and Trim: Brake-formed sheet metal in the same thickness and finish to match the panels.
- K. Fasteners: Clips, anchoring devices, fasteners, and accessories for installation of panel system as recommended by panel manufacturer for the system specified.
- L. Sealant: Sealant as recommended by panel manufacturer.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine structural members before beginning installation to ensure that all supporting members are straight, level, plumb and satisfactory for panel installation.
- B. Verify intermediate framing member and secondary structural supports are aligned to the following tolerances:
  1. 0 to 1/4 inch outward of the actual wall framing plane for members at 10 foot or greater spacing.
  2. 0 to 1/8 inch outward of the actual wall framing plane for members at 5 foot to 10 foot spacing.
  3. 0 to 1/16 inch outward of the actual wall framing plane for members at less than 5 foot spacing.
- C. Verify wall openings, windows, doors, or louvers through walls are properly located.
- D. Correct defective conditions before beginning work.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and recommendations including approved shop drawings, installation guidebook and manufacturer's handbook of construction details.
- B. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.
- C. Install flashing and trim true and in proper alignment.
- D. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tightness and integrity of the vapor barrier.

### **3.3 CLEANING**

- A. Replace damaged panels and other components of work, which cannot be repaired by finish touch-up or similar minor repair.

- B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

**3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 08 00 10**  
**DOORS AND WINDOWS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Flush Steel Doors
- B. Steel frames
- C. Door Hardware
- D. Vinyl Windows

**1.2 RELATED REQUIREMENTS**

- A. Section 06100 - Rough Carpentry
- B. Section 09 91 00 - Painting

**1.3 REFERENCES**

- A. ANSI/NFPA 80 - Standard for Fire Doors and Windows.
- B. ANSI/DHI A 115.IG - Installation Guide for Doors and Hardware.
- C. ANSI/BHMA A 156 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.
- D. ANSI/BHMA A156.7 - Hinge Template Dimensions.
- E. ANSI A 250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
- F. ANSI/SDI A 250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
- G. ANSI A 250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- H. ANSI A 250.11 - Recommended Erection Instructions for Steel Frames.
- I. ASTM A 366/A 366M - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
- J. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- K. ASTM A 924 - Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot Dip Process.
- L. ASTM A 1008/1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

- M. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- N. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.
- O. ASTM E 413 - Classification for Rating Sound Insulation.
- P. SDI-111 - Recommended Standard Details for Steel Doors & Frames.
- Q. NAAMM/HHMA-820 TN01 - Grouting Hollow Metal Frames
- R. NAAMM/HHMA-820 TN03 - Guidelines for Glazing of Hollow Metal Transom, Sidelight and Windows
- S. NAAMM/HMMA-840 - Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.
- T. ANSI/UL 10C - Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.
- U. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
- V. Federal Emergency Management Agency (FEMA) 361 Guidelines.
- W. UL - Building Materials Directory; Underwriters Laboratories Inc.
- X. ANSI A117.1 - American National Standard for Accessible and Useable Buildings and Facilities.
- Y. ANSI A156.2 - American National Standard for Bored and Preamsembled Locks & Latches
- Z. ANSI A156.3 - American National Standard for Exit Devices
- AA. ANSI A156.4 - American National Standard for Door Controls - Closers.
- BB. ANSI A156.5 - American National Standard for Auxiliary Locks and Associated Products.
- CC. ANSI A156.13 - American National Standard for Mortise Locks and Latches Series 1000.
- DD. AAMA/NWWDA 101/I.S. 2 - Voluntary Standard for Aluminum and Poly (Vinyl Chloride) (PVC) Prime Windows and Glass Doors. Maintain one copy of each document on site.
- EE. National Fenestration Rating Council (NFRC).
- FF. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- GG. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

HH. IGCC – Classification of Insulating Glass Units; Insulated Glass Certification Council.

II. U.S. Department of Energy – Energy Star Windows Program.

#### **1.4 SUBMITTALS**

A. Product Data: Manufacturer's standard details and catalog data indicating compliance with referenced standards, and manufacturer's installation instructions.

B. Certificates:

1. Manufacturer's certification that products comply with referenced standards.

2. Evidence of manufacturer's membership in the Steel Door Institute.

C. Shop Drawings: Door, frame, and hardware schedule. Show types, quantities, dimensions, specified performance, and design criteria, materials and similar data for each opening required.

1. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.

2. Indicate door elevations, internal reinforcement, closure method, and cutouts for glass lights and louvers.

3. Details of glazing.

4. Complete schedules of hardware.

#### **1.5 QUALITY ASSURANCE**

A. Supplier: Qualifications: Company specializing in furnishing the products specified for projects of similar size and scope.

B. Installer Qualifications: Company specializing in installation of the products specified for projects of similar size and scope with minimum five years documented experience.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

A. Handle, store and protect products in accordance with the manufacturers printed instructions and ANSI/SDI A250.10 and NAAMM/HMMA 840.

B. Store doors vertically in a dry area, under a proper vented cover. Place on 4 inch (102 mm) high wood sills to prevent rust or damage. Provide 1/4-inch (6 mm) space between doors to promote air circulation.

C. Store frames in an upright position with heads uppermost under cover. Place on 4 inch (102 mm) high wood sills to prevent rust and damage. Store assembled frames five units maximum in a stack with 2 inch (51 mm) space between frames to promote air circulation.

D. Do not use non-vented plastic or canvas shelters to prevent rust or damage.

- E. Should wrappers become wet, remove immediately.

### **1.07 COORDINATION**

- A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
- B. Coordinate Work with frame opening construction, door and hardware installation.
- C. Sequence installation to accommodate required door hardware.
- D. Verify field dimensions for factory assembled frames prior to fabrication.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Provide steel doors, frames, hollow metal windows, door hardware, and vinyl windows of the size, type, and finish as indicated on the Drawings.

### **2.2 DOORS AND FRAMES**

- A. General: Construct doors, frames, and hollow metal window frames to the following designs and gages:
  - 1. Doors: Zinc-Iron Alloy-Coated Galvannealed steel, ASTM A 653, Class A60:
    - a. Thickness: 16 gage (1.3 mm).
    - b. Include Galvannealed components and internal reinforcements with Galvannealed doors.
    - c. Close and seal tops of doors to eliminate moisture penetration. Galvannealed steel top caps are permitted.
  - 2. Finish: Clean, phosphatize and factory prime all doors. Finish coat in accordance with the Drawings and Specifications.
  - 3. Hardware Reinforcements:
    - a. Hinge reinforcements for full mortise hinges: minimum 7 gage (4.7 mm).
    - b. Lock reinforcements: minimum 16 gage (1.3 mm).
    - c. Closer reinforcements: minimum 14 gage (1.7 mm) steel, 20-inch (508 mm) long.
    - d. Galvannealed doors: include Galvannealed hardware reinforcements.
    - e. Projection welded hinge and lock reinforcements to the edge of the door.
    - f. Provided adequate reinforcements for other hardware as required.

### **2.3 DOOR AND FRAME ACCESSORIES**

- A. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.
- A. Door Bottom: In accordance with Door Schedule on Drawings.
- B. Re-Light: Where indicated in Door Schedule on Drawings provide two panes of laminated safety glass in a steel frame finished to match door.

### **2.4 DOOR AND FRAME FABRICATION**

- A. Factory-welded frames: Head and jamb intersecting corners mitered at 45 degrees, with back welded joints ground smooth.
  - 1. Continuous face weld the joint between the head and jamb faces along their length either internally or externally. Grind, prime paint, and finish smooth face joints with no visible face seams.
  - 2. Externally weld, grind, prime paint, and finish smooth face joints at meeting mullions or between mullions and other frame members per a current copy of ANSI/SDI A250.8.
  - 3. Provide temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.
- B. Provide cutouts and reinforcements required for electrical and security components specified elsewhere in this specification.

### **2.5 DOOR AND FRAME FINISHES**

- A. Chemical Treatment: Treat steel surfaces to promote paint adhesion.
- B. Factory Prime Finish: Meet requirements of ANSI A 250.10.
- C. Finish painting in accordance with the Drawings and Specifications.

### **2.6 DOOR HARDWARE**

- A. Furnish and Install all door hardware in accordance with the Door Hardware schedules shown on the Drawings.

### **2.7 VINYL WINDOWS**

- A. Acceptable Manufacturer: Cascade Windows, Alpine Windows, or approved equal.
- B. Single Hung Windows:
  - 1. Rating: DP50 (Upgrade).
  - 2. Glazing: ST Energy Star (Clear-Argon-Low E-HP Spacer)
    - 1) U Factor: 0.30.
    - 2) SHGC: 0.29.
    - 3) VLT: 0.55.
  - 3. Grid: Flat.

4. Color: White.
5. Operator Type: Slider.
6. Screen: Furnish with factory bug screen.

### **PART 3 – EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that project conditions are acceptable before beginning installation of frames. Verify that completed openings to receive knock-down wrap-around frames are of correct size and thickness.
- B. Do not begin installation until conditions have been properly prepared.
- C. Correct unacceptable conditions before proceeding with installation.

#### **3.2 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's printed installation instructions and with Steel Door Institute's recommended erection instructions for steel frames ANSI A250.11 and NAAMM/HMMA 840.
- B. Remove temporary steel spreaders prior to installation of frames.
- C. Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.
  1. Field splice only at approved locations indicated on the shop drawings.
  2. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
- D. Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.
- E. Apply hardware in accordance with hardware manufacturers' instructions and Section 08710 – Door Hardware. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide uniform clearance at head and jambs, to achieve maximum operational effectiveness and appearance.

#### **3.3 ADJUST AND CLEAN**

- A. Adjust doors for proper operation, free from binding or other defects.
- B. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.
- C. Finish Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of finish coat and apply coating to match.

#### **3.4 PROTECTION**

- A. Protect installed products and finished surfaces from damage during construction.

**END OF SECTION**

## **SECTION 09 91 00**

### **PAINTING**

#### **PART 1 – GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Surface preparation, priming, and painting of interior and exterior building surfaces.
- B. Applies to both shop fabrication and field construction.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 05 12 10 - Structural Steel Framing and Fabrications
- B. Section 06 10 00 - Rough Carpentry
- C. Section 08 00 10 - Doors and Windows
- D. Section 23 05 00 - Common Work Results for Mechanical

##### **1.3 DELIVERY, HANDLING, AND STORAGE**

- A. All materials shall be new and be delivered to the project site in unopened containers. Paints shall be stored in a suitable protected area that is heated or cooled as required to maintain temperatures within the range recommended by the paint manufacturer.
- B. Paint containers shall bear labels that plainly show the following:
  - 1. Name or title of material.
  - 2. Federal Specification number, if applicable.
  - 3. Manufacturer's name.
  - 4. Manufacturer's stock number and date of manufacture.
  - 5. Color name and number.
  - 6. Contents by volume, for major pigment and vehicle constituents.
  - 7. Thinning instructions.
  - 8. Application instructions.

##### **1.4 SUBMITTALS**

- A. Submit Technical Data Sheets for each type of paint specified and associated thinner. Include specific color for each product.

#### **PART 2 – PRODUCTS**

##### **2.1 MATERIALS**

- A. Epoxy: Self-priming, two-part epoxy, minimum 80% solids, low VOC compliant. PPG Amerloc 2 VOC or approved equal. Custom tint to ANSI 61 gray.

- B. Cold Galvanizing: Cold application, single product galvanic coating, minimum 95% dry film solids, low VOC compliant. ZRC or approved equal.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. All materials of a paint system, including primer and finish coats, shall be produced by the same paint manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer of the particular coating.
- B. Paint all exposed surfaces, whether or not designated in "Schedules", except where the natural finish of the material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent or similar materials or areas, or as directed by the Authority. If color or finish is not designated, Contractor shall notify the Authority of these items. Authority will select the color or finish from standard colors available for the materials systems specified.

#### **3.2 EXAMINATION**

- A. It is the intent of these Specifications that Contractors and their subcontractors employed on the jobsite will leave the surfaces of their work in such a condition that only minor cleaning, sanding, and filling is required prior to surface preparation and painting. It is the responsibility of the Contractor to inspect and provide substrate surfaces that are prepared in accordance with these Specifications and the printed directions and recommendations of the paint manufacturer whose product is to be applied.

#### **3.3 PROTECTION OF MATERIALS NOT TO BE PAINTED**

- A. Remove, mask, or otherwise protect factory finished surfaces, hardware, plumbing fixtures and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Openings in motors shall be masked to prevent paint and other materials from entering the motors.

#### **3.4 ENVIRONMENTAL CONDITIONS**

- A. Apply paint only when the temperature of surfaces to be painted and the surrounding air temperatures are the manufacturer's recommended maximum and minimum allowable range.
- B. Do not apply paint in heavy dust or smoke laden atmosphere.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces.
- D. Painting may be continued during inclement weather, only if the areas and surfaces to be painted are enclosed and heated within the temperature and humidity limits specified by the paint manufacturer during application and drying periods.

- E. Do not apply paint materials when temperature and humidity conditions can reasonably be predicted to change from manufacturer's application limitations prior to the elapse of adequate drying time.

### **3.5 SAFETY**

- A. Painting shall be performed in strict accordance with the safety recommendations of the paint manufacturer; with the safety recommendations of the National Association of Corrosion Engineers contained in the publication, Manual for Painter Safety; federal, state, and local agencies having jurisdiction.

### **3.6 PAINT MIXING**

- A. Multiple-component coatings shall be prepared using all of the contents of the container for each component as packaged by the paint manufacturer. No partial batches will be permitted. Multiple-component coatings that have been mixed shall not be used beyond their pot life. Contractor shall provide small quantity kits for touch-up painting and for painting other small areas. Only the components specified and furnished by the paint manufacturer shall be mixed. No intermixing of additional components for reasons of color or otherwise, even within the same generic type of coating, will be permitted.
- B. Paint materials shall be kept sealed when not in use.

### **3.7 LOCATION WHERE PAINTING IS PERFORMED**

- A. Surface preparation and painting shall be done at the project site, or in the shop fabrication facility.

### **3.8 PREPARATION OF SURFACES**

- A. General:
  - 1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified for each particular substrate condition.
  - 2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted; or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
  - 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.
- B. Preparation of Structural Steel Surfaces and Doors:
  - 1. Minimum surface preparation shall be Commercial Blast Cleaned per SSPC-SP6. Remove all oil and grease in accordance with the Solvent Cleaning requirements outlined in this section.

2. Coating Time: Coat any bare steel within 8 hours or before flash rusting occurs.
  3. Sharp edges, surface defects, or protrusions shall be ground flat and smooth. Any welded areas shall be sanded before painting.
- C. Preparation of Existing Coated Surfaces:
1. Existing coated or primed surfaces to be repainted or final coated shall be solvent cleaned and freshwater rinsed. Loose, abraded, or damaged coatings shall be cleaned to substrate by Hand or Power Tool, SSPC-SP2 or SSPC-SP3. Surrounding intact coating shall be feathered. One spot coat of the specified primer shall be applied to bar areas overlapping the prepared existing coating. One full finish coat of the specified primer or finish coat(s) shall be applied overall. If an aged, plural-component material is to be top coated, contact the coating manufacturer concerned for additional surface preparation requirements.
  2. In the case of an application of a cosmetic coat the exact nature of the existing coatings is not known in all cases; and, while it is assumed that they have oxidized sufficiently to prevent lifting or peeling when over coated with the paints specified, the compatibility shall be checked by application to a small area prior to starting the painting. If lifting or other problems occur, request disposition from the Authority.
- D. Solvent Cleaning: Solvent cleaning shall consist of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by the use of solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods which involve a solvent or cleaning action. This method conforms with SSPC-SP1. For primed or previously painted surfaces the solvent shall be compatible with the existing coating.

### **3.9 APPLICATION OF PAINT**

- A. General:
1. Manufacturer's written instructions for applying each type of paint or protective coating shall be furnished to the Authority prior to application. Cleaned surfaces and all coats shall be inspected prior to the succeeding coat. Schedule such inspection with the Authority in advance. Apply all coatings in strict accordance with the paint manufacturer's recommendations, as reviewed by the Authority. Sufficient time shall be allowed between coats to assure thorough drying of previously applied paint.
  2. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint until the paint film is of uniform finish, color, and appearance. Give special attention to ensure that all surfaces including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- B. Application:

1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
2. Paint the back sides of access panels and removable or hinged covers, locker doors, etc., to match the exposed surfaces.
3. Finish exterior doors and frames, on tops, bottoms, and side edges, the same as the exterior faces, unless otherwise indicated.
4. Sand lightly between each succeeding coat.
5. Spray finish metal doors and frames and similar surfaces to achieve finishes that are completely void of brush stroke tracks and marks.
6. Units to be bolted together and to structures shall be painted and paint shall be fully cured prior to assembly or installation.

C. Film Thickness:

1. Coverage is listed as total minimum dry film thickness in mils (DFT). The number of coats is the minimum required irrespective of the coating thickness. Additional coats may be required to obtain the minimum required paint thickness, depending on method of application, differences in manufacturers, products, and atmospheric conditions. Maximum film build per coat shall not exceed the coating manufacturer's recommendations.
2. All surfaces shall be visually inspected to ensure proper and complete coverage has been attained.
3. Particular attention shall be given edges, angles, flanges, etc. Where insufficient film thicknesses are likely to be present, ensure proper millage in these areas.

D. Damaged Coatings:

1. Damaged coatings, pinholes, and holidays shall have the edges feathered and repaired in accordance with the recommendations of the paint manufacturer, as reviewed by the Authority.
2. All finish coats, including touch-up and damage-repair coats shall be applied in a manner which will present a uniform texture and color-matched appearance.

E. Unsatisfactory Application:

1. If the item has an improper finish color, or insufficient film thickness, the surface shall be cleaned and top coated with the specified paint material to obtain the specified color and coverage. Specific surface preparation information to be secured from the coating manufacturer and the Authority.
2. All visible areas of chipped, peeled, or abraded paint shall be hand- or power-sanded feathering the edges. The areas shall then be primed and finish coated in accordance with the Specifications. Depending on the

extent of repair and its appearance, a finish sanding and topcoat may be required by the Authority.

3. Work shall be free of runs, bridges, shiners, laps, or other imperfections. Evidence of these conditions shall be cause for rejection.
4. Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer.

### **3.10 SHIPPING**

- A. In all cases where pre-coated items are to be shipped to the jobsite, all efforts shall be made to protect the coating from damage. Coated items shall be battened to prevent abrasion. Contractor shall use non-metallic or padded slings and straps in handling. Items will be rejected for excessive damage, in the opinion of the Authority.

### **3.11 SCHEDULING PAINTING**

- A. Apply the first coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- B. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

### **3.12 CLEANUP**

- A. All cloths and waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a legal manner. Paint spots, oil, or stains upon adjacent surfaces and floors shall be completely removed, and the entire job left clean and acceptable to the Authority.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

### **3.13 PROTECTION**

- A. Protect work of other trades, whether to be painted or not, against any damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting as acceptable to the Authority.
- B. At the completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

**END OF SECTION**

**SECTION 11 95 13**  
**SPILL RESPONSE EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

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

**1.2 REFERENCES**

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

**1.3 SUBMITTALS**

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

**1.4 GENERAL**

- A. Contractor is responsible for providing spill response equipment as specified and in accordance with this Section.
- B. The Response Connex shall be placed in the location shown on the drawings.
  - 1. Place all spill response equipment, including overpack drums, inside contractor provided Connex.
  - 2. Contractor shall provide shelving within the Connex as required to adequately store, organize and support the specified spill equipment, extra facility parts and associated facility tools.

**PART 2 - PRODUCTS**

**2.1 SPILL RESPONSE EQUIPMENT**

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

Quantity	Item/Description
<b>Absorbent Material and Containers</b>	
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
13 EA	Absorbent Boom, min. 6" x 40', min. 100 gal/40'
2 EA	Absorbent Sweep, 19" x 100', min absorb 25 gal/bale
<b>Personnel Protective Equipment</b>	
4 Pair	Gloves, Nitrile AF18 Chem-Resist, Pairs
4 EA	Tyvek Suits, XL Polyethylene Coated, zipped front, elastic wrist and
4 EA	Goggles, UVEX Futura
4 EA	Hardhats, Bullard Traditional, with 6-point ratchet suspension, orange
<b>Recovery Equipment</b>	
2 EA	3500 gallon Fold-A-Tank
1 EA	2-inch portable centrifugal pump, gas-powered Gorman Rupp #82D1-8-X rated at 160 gpm with 2" camlocks. Pre-Approved Alternates: (Option #1: Marlow 2AM32-P rated at 140 gpm with 2" camlocks) (Option #2: Homelite #320 rated at 140 gpm with 2" camlocks)
1 EA	Discharge Hose with 2" camlocks, 100' total length
1 EA	Suction Hose with 2" camlocks, 50' total length
2 EA	Shovel, square point, wood handle
2 EA	Rake, 16-tine forged bow, wood handle
2 Roll	Garbage/Disposal Bags, heavy duty, 100ct./roll, 33-gal., 4-mil, printed "Oily Waste"
<b>Miscellaneous</b>	
1 EA	Smart Ash Incinerator
--	Fire Extinguishers, Portable, Type 4A-80BC (See Drawings for quantity)

1 EA	Connex, 20 foot, lockable
AS REQD	Padlocks, keyed-alike (for each gate, enclosure, connex, etc. plus 2 spares)

**PART 3 - EXECUTION**

**3.1 NOT USED**

**END OF SECTION**

## **SECTION 21 13 30**

### **HIGH PRESSURE WATER MIST FIRE SUPPRESSION**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. The work involves design, installation, testing, and certification of an automatic fire suppression system for power generation plants in Nikolai and Venetie, Alaska. The power plants will contain three diesel engine generators as indicated.
- B. The power plant building and all equipment will be new. All fire suppression system installation, testing, certification, and training will occur on site.
- C. The Work shall include but not be limited to:
  - 1. Design system in accordance with the latest adopted editions of all applicable codes and standards, manufacturer's requirements, these specifications, and the Drawings.
  - 2. Obtain a State of Alaska, Fire Marshal Plan Review Permit.
  - 3. Furnish and install a complete system.
  - 4. Program fire control panel.
  - 5. Filling and charging system.
  - 6. Acceptance testing, commissioning, and certification of completed system.
  - 7. Minimum four hours operation training with local operators and Authority.
  - 8. Operation and Maintenance Manuals including as-built drawings.

##### **1.2 RELATED REQUIREMENTS**

- A. Division 1.
- B. Division 23.
- C. Division 26.

##### **1.3 QUALITY ASSURANCE**

- A. All equipment shall be new and shall be listed for the intended application. The entire system shall be designed and fabricated in accordance with recognized and acceptable engineering and industry practices.
- B. Design shall be prepared by a registered mechanical engineer or technician with minimum NICET Level 3 certification. Designer shall have an appropriate State of Alaska design permit.
- C. The Contractor shall be authorized by the fire suppression system manufacturer to furnish and install the specified system. Field installation shall be performed by technicians certified by the manufacturer to install the specified system.

#### **1.4 REFERENCED STANDARDS:**

- A. National Fire Protection Association (NFPA) 750: Standard on Water Mist Fire Protection Systems.
- B. Underwriters Laboratories (UL) UL 864 Control Units for Fire Protective Signaling Systems
- C. National Fire Protection Association (NFPA) NFPA 72 National Fire Alarm Code
- D. National Electrical Manufacturer's Association (NEMA).

#### **1.5 SUBMITTALS**

- A. Provide submittals in the manner described herein and in Division 1.
- B. Provide submittals for all products and systems described in Division 21 specifications and shown on the Drawings to demonstrate compliance with the requirements of the project. Submittal to include:
  - 1. Manufacturer, model numbers and quantity of each device.
  - 2. Manufacturer and model of control panel, including installed options.
  - 3. Agent piping layout including size and quantity of nozzles.
  - 4. Calculations.
  - 5. Shop drawings shall indicate compliance with all requirements of the specifications and shall contain at a minimum:
    - a. Floor Plans and Isometrics for agent piping.
    - b. Floor Plans and Diagrams for Wiring complete with circuit designation in accordance with Wire Schedule on the Drawings (A-B-C-D-E).
    - c. Panel and device installation details.
    - d. Bill of Materials
    - e. Installation notes and system Sequence of Operation.
- C. Based upon review comments by the Authority, issue final revised submittal including final construction drawings.
- D. Submit a copy of State of Alaska, Fire Marshal Plan Review Permit to the Authority.
- E. Prior to testing, certification, and training provide Operation and Maintenance Manuals. Manuals to include system description, manufacturer's catalog information, programming, instructions, operations and maintenance literature, Material Safety Data Sheets (MSDS) for extinguishing agent, and as-built drawings of completed system. Deliverables to include one bound copy plus 4 CD's with PDF format electronic files of the entire manual.

#### **1.6 SUBSTITUTIONS**

- A. All substitutions shall be noted on equipment submittals.

#### **1.7 WARRANTY**

- A. Division 1 - Closeout Requirements: Warranties.

- B. Provide a one-year manufacturer's warranty covering all materials and workmanship of all products supplied. Warranty shall commence from the date of system certification.

## **PART 2 - MATERIALS**

### **2.1 FIRE SUPPRESSION AGENT**

- A. A high pressure water mist fire suppression system shall be furnished, Marioff Hi-Fog or approved equal. In order for a substitution of the suppression system to be approved it must have at a minimum the following salient features:
  - 1) The system must use water mist as the sole extinguishing agent.
  - 2) The system must use high pressure (2,000 PSI nominal) nitrogen as the sole driving agent without the aid of any pumps.
  - 3) The system shall be a single pipe system utilizing stainless steel tubing not exceeding 1" outside diameter.
  - 4) The complete agent rack including all water and nitrogen storage for one zone of coverage shall not exceed the following dimensions: 4'-6" Long x 1'-4" Wide x 7'-6" High.

### **2.2 AGENT RACK AND WATER TANK**

- A. Wall or floor mounted racks shall be provided that contain the agent cylinders, nitrogen cylinder, and piping. Marioff Hi-Fog MAU 150 FS or approved equal.
- B. The racks shall be designed for the appropriate seismic code and shall be adequately anchored to the building structure.

### **2.3 FIRE CONTROL PANEL**

- A. The Fire Control Panel shall be a Fike Cheetah XI-50 10-071-R1 or approved equal, and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with, supervise and control the following types of equipment used to make up the system: intelligent self-calibrating smoke and flame detectors, addressable modules, annunciators, and other system controlled devices.
- B. Basic equipment to be included with Fire Control Panel shall be main board with display and keypad, door, hardware, and backbox for panel surface mount installation.
- C. System Capacity and General Operation
  - 1. The control panel shall be capable of 50 intelligent/addressable devices.
  - 2. The system shall include two Class B (NFPA Style Y) programmable Notification Appliance Circuits. It shall also include three additional programmable Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC.
  - 3. The system shall support up to 99 programmable EIA-485 driven relays for an overall system capacity of 301 circuits.
  - 4. The Fire Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual,

color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire system.

5. All programming or editing of the existing program in the system shall be achieved without special equipment, and without interrupting the alarm monitoring functions of the Fire Control Panel.
6. The Fire Control Panel shall provide the following features:
  - a. Automatic detect test and drift compensation to extend detector accuracy over life (smoke and flame detectors monitored and automatically calibrated)
  - b. Sensitivity Test, meeting requirements of NFPA 72, Chapter 5.
  - c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
  - d. System Status Reports to display.
  - e. Positive Alarm Sequence pre-signal, meeting NFPA 72 3-8.3 requirements.
  - f. Periodic Detector Test, conducted automatically by software.
  - g. Pre-alarm for advanced fire warning.
  - h. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
  - i. Walk Test, with check for two detectors set to same address.
  - j. Adjustable delay and discharge timers.
  - k. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
  - l. The detector software shall allow manual or automatic sensitivity adjustment.
  - m. Event history file in nonvolatile memory.
  - n. Panel to have abort option to manually prevent release of extinguishing agent.
  - o. Battery back-up in the event of normal AC power failure.
  - p. Unit to be able to release extinguishing agent in at least two independent hazard zones.

#### **2.4 SECONDARY POWER SOURCE BATTERIES**

- A. Secondary power shall be provided by 12 volt batteries. The batteries shall be sealed and shall be completely maintenance free.
- B. Batteries shall have sufficient capacity to power the fire system for not less than twenty-four hours standby operation plus 30 minutes of alarm upon a normal AC power failure. Note that this is in excess of minimum NFPA requirements.

## **2.5 HEAT DETECTOR**

- A. UL Listed, adjustable temperature heat detector. Fike 60-1039 or approved equal. Set to activate at 135°F for normal temperature and 190°F for high temperature.

## **2.6 FLAME (OPTICAL) DETECTOR**

- A. UL Listed, flame detectors shall be multi-spectrum, UV/Dual IR/Vis electro-optical, automatic calibrating, digital fire detectors. Honeywell FS-20X or approved equal. Install on swivel mount.

## **2.7 SMOKE (PHOTOELECTRIC) DETECTOR**

- A. UL Listed, automatic calibrating type, photoelectric smoke detector. Detector to be addressable and provide analog signal to the control panel which may be used for maintenance of detector. Fike 63-1052 or approved equal.

## **2.8 ANNUNCIATORS**

- A. Interior Annunciator (Alarm and Discharge) - UL Listed, Horn/strobe combination, minimum 75 candela. Gentex GEC3-24WR or approved equal.
- B. Exterior Annunciator (Alarm) - Weatherproof, UL Listed horn/strobe combination, minimum 75 candela. Gentex WGEC24-75WR or approved equal.
- C. Exterior Strobe (Discharge) - Weatherproof, UL Listed strobe, minimum 75 candela. Gentex WGES24-75WR or approved equal.

## **2.9 MANUAL PULL STATION**

- A. Manual pull station(s) shall be UL Listed, addressable, double action, and provide visible indication that station has been operated.
  - 1. FIRE SUPPRESSION RELEASE: Honeywell MS-2H or approved equal.

## **2.10 DEVICE MONITORING MODULES**

- A. UL Listed modules designed for use with intelligent and addressable equipment as required. Fike Series 55 or approved equal.

## **2.11 PLACARDS**

- A. Provide placards in compliance with NFPA as required. Provide additional warning placards as indicated on the plan in accordance with the Placard Schedule.

## **2.12 RACEWAYS AND CONDUCTORS**

- A. Route all wiring in separate dedicated raceways for all fire suppression system wiring at no cost to Contractor. All raceways shall be electrical metallic tubing (EMT). All raceways, junction boxes, pull boxes, and cover plates shall be painted red.
- B. All conductors shall be soft drawn copper, Type XHHW insulation; 600V and 75C rated; gauge and color as indicated by service in accordance with the following schedule:
  - 120V AC Power - 12 AWG, stranded, color per station service scheme.
  - 24V DC Power, Detection, and Alarm Circuits - 14 AWG, color in accordance with the Wire Schedule.

### **2.13 NOZZLES**

- A. In Total Flooding and Local Application zones nozzles shall be open spray head type, Marioff 4S 1MC 8MB 1100 or approved equal.

### **2.14 PIPING**

- A. Contractor shall furnish, install, and pressure test agent discharge tubing/piping in accordance with manufacturer's recommendations.

### **2.15 SUPPORT**

- A. Contractor shall furnish and install industry standard hangers for agent discharge piping, raceways, panel and all devices.

### **2.16 FITTINGS, VALVES, CONTROLS, AND DEVICES**

- A. Contractor shall furnish and install all required fittings, valves, control devices, and accessories as required to provide the types of coverage required for each zone as indicated on the Drawings.

## **PART 3 - EXECUTION**

### **3.1 DESIGN**

- A. The system shall be designed and installed in accordance with the latest adopted editions of all applicable codes and standards and manufacturer's requirements.
- B. Design fire suppression system with two zones of coverage as shown on the Drawings.
  - 1. Zone 1 (Generation Room) shall contain agent rack, discharge piping and nozzles. Two flame detectors shall be cross-zoned so that any one detector will set off alarm and shut-down generators. Any second detector will begin a 30 second countdown to agent release. Two high temperature heat detectors shall be cross-zoned in the same sequence as the flame detectors. Exit shall have a manual "FIRE SUPPRESSION RELEASE" pull station which will begin a 30 second countdown to agent release when activated.
  - 2. Zone 2 (Control Room) shall contain the control panel, one smoke detector and one normal temperature heat detector. Either detector will set off alarm and will shut-down generators. Exit shall have a manual "FIRE SUPPRESSION RELEASE" pull station which will begin a 30 second countdown to agent release when activated.
- C. Provide annunciators and other devices where specifically indicated on the Drawings.

### **3.2 INSTALLATION**

- A. The system shall be installed in accordance with the Drawings and Specifications, the approved submittal, and all manufacturer's requirements.
- B. Contractor shall perform all work with skilled craftsmen specializing in said work with all required certifications. Install all materials in a neat, orderly, and secure fashion, as required by these specifications, manufacturer's requirements, and commonly recognized standards of good workmanship.

### **3.3 TESTING AND TRAINING**

- A. Contractor shall provide a minimum of two weeks' notice to the Authority prior to system testing and operator training.
- B. Upon completion of testing and certification the system shall be left with one fully charged nitrogen cylinder installed in the rack plus one fully charged spare nitrogen cylinder.

**END OF SECTION**

## **SECTION 23 05 00**

### **COMMON WORK RESULTS FOR MECHANICAL**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the Drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.
- B. Section includes:
  - 1. General mechanical work.
  - 2. Painting and marking.
  - 3. Valve tags, signs, and placards.
  - 4. Flashing and sealing.

##### **1.2 RELATED REQUIREMENTS**

- A. Division 1
- B. All other Division 23 Specifications
- C. Divisions 21 and 26

##### **1.3 PROJECT RECORD DRAWINGS**

- A. In addition to other requirements of Division 1, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building.
- B. Provide one set of drawings clearly marked up with all as-built information to the Authority within two weeks of completion.
- C. At completion of project, deliver these drawings to the Authority and obtain a written receipt.

##### **1.4 SUBMITTALS**

- A. Provide submittals for all products and systems described in Division 23 specifications and shown on the Drawings to demonstrate compliance with the requirements of the project. Provide submittals in the manner described herein and in Division 1.
- B. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment. 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. Painting and Marking: Submit manufacturers catalog literature for each product required.

- C. Product Data: Submit manufacturers catalog literature for paint, caulking, flashing, pipe marking, and all other items specified under this Section.
- D. Valve Tags: Provide submittal for specific tags as indicated on the Schedule on Sheet M1.2.
- E. Signs and Placards: Provide submittal as indicated on the Schedule on Sheet M1.2.
- F. Equipment: Submit manufacturers catalog literature for each item indicated on the Mechanical Schedules on Sheet M1.1 under the Division 23 Sections that follow. See specific requirements under each section.

### **1.5 RECEIVING AND HANDLING**

- A. See general conditions and the general requirements in Division 1 regarding material handling.
- B. Deliver packaged materials to the jobsite in unbroken packaging with manufacturer's label, and store to facilitate inspection and installation sequence.
- C. Protect all materials and equipment during the duration of construction work against contamination and damage. Replace or repair to original manufactured condition any items damaged during construction. Immediately report any items found damaged to the Authority prior to commencing construction.

### **1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Division 1 - Material and Equipment: Storage and protection.

### **1.7 QUALITY ASSURANCE**

- A. Division 1 - Quality Control
- B. Perform all work in accordance with the latest adopted editions of the International Fire Code, the International Building Code, and the International Mechanical Code including State of Alaska amendments. Comply with all applicable State and Federal regulations.
- C. Perform work with skilled craftsman specializing in said work. Install all materials in a neat and orderly, and secure fashion as required by specifications and commonly recognized standards of good workmanship.

### **1.8 SCHEDULE OF WORK**

- A. The work must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meet scheduled completion dates, and to avoid delaying any other trade.

- B. The Authority will set up completion dates. Each Contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

### **1.9 SUBSTANTIAL COMPLETION**

- A. Provide advance written notice to the Authority in accordance with Section 01 77 00 - Contract Closeout Procedures to schedule substantial completion inspection. The Authority will generate a punchlist of corrective action items during the inspection. Work will not be considered complete until all corrective action items in the Authority's punch list have been satisfactorily completed and photographic or other positive documentation has been provided to the Authority.

### **1.10 COOPERATION AND CLEANING UP**

- A. The Contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.
- B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Authority, clear any designated area or areas of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

### **1.11 SPECIAL CONDITIONS**

- A. Ensure that the appropriate safety measures are implemented and that all workers are aware of the potential hazards from electrical shock, burn, rotating fans, pulleys, belts, hot manifolds, noise, etc. associated with working near power generation and control equipment.

### **1.12 WARRANTY**

- A. Division 1 - Closeout Requirements: Warranties.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- A. Provide all equipment and materials required for a complete system.
- B. All equipment and materials supplied under this Contract are new unless specifically indicated as existing. Where additional or replacement items are required, provide like items by the same manufacturer to the maximum extent practical.
- C. Install all material and equipment in accordance with manufacturer's installation instructions and recommendations unless specifically indicated otherwise.

## **2.2 PAINTING**

- A. Paint all steel fabrications and tanks as indicated in fabrication details. Sandblast all exterior surfaces in accordance with SSPC-SP-6. Prime and top coat with two coats self-priming epoxy, PPG Amerloc 2 VOC or approved equal, color ANSI 61 Gray.
- B. Interior Carbon Steel Pipe - Paint all exposed carbon steel pipe and fittings that is not insulated except for engine exhaust. Wire brush and wipe down with solvent. Prime with one coat of alkyd primer, PPG Multiprime 4160 or approved equal, color gray. Finish with one coat of alkyd enamel, PPG Devguard 4308 or approved equal, color ANSI 61 Gray.
- C. Exterior Carbon Steel Pipe - Paint all exposed carbon steel pipe and fittings except for engine exhaust. Wire brush and wipe down with solvent. Prime and finish with two coats of Cold Galvanizing Compound, ZRC or approved equal.
- D. Touch-up – finish all cut ends and damaged surfaces of galvanized and zinc plated supports and fasteners with spray on Cold Galvanizing Compound, ZRC or approved equal. Touch up paint on fabricated items to match original.

## **2.3 PIPE MARKING**

- A. Install flow arrows on diesel fuel, used oil, cooling, and heat recovery piping. On insulated piping install flow arrows over jackets. Black or white arrows over colored backgrounds, self-adhesive vinyl, Seton arrows on roll or approved equal. Background color scheme to match the colors listed for Specific Function Valve Tags.

## **2.4 FLASHING AND SEALING**

- A. Caulking - Polyurethane-based sealant, Sika Sikaflex 1A, or approved equal. Color gray except where installed against white painted surfaces color white.
- B. For all penetrations of interior walls and small pipe (less than 2”) penetration of exterior walls seal with polyurethane caulking all around both surfaces.
- C. For 2” and larger pipe penetration of exterior walls install flashing as indicated on Drawings. Best Materials Multi-Flash Master Flash or approved equal, Black EPDM. Note that the retro-fit style may be used for convenience.

## **2.5 VALVE TAGS**

- A. Specific Function Valve Tags – For all valves marked with a specific function, provide tags color coded and worded as indicated on the Schedule on Sheet M1.2.
- B. Standard Valve Tags – For all valves not marked with a specific function, provide NO/NC tags as indicated on the schedules Seton or equal..
- C. Install all tags as noted.

## **2.6 SIGNS AND PLACARDS**

- A. Provide decals and sign boards, color coded and worded as indicated on the Schedule on Sheet M1.2. Install as noted.

## **PART 3 - EXECUTION**

### **3.1 DRAWINGS**

- A. The mechanical Drawings are generally diagrammatic and do not necessarily show all features of the required work. Provide all equipment and materials required for a complete system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see other Drawings which may include electrical, architectural, structural, and civil. Coordinate work under this section with that of all related trades.
- B. Contractor to field verify all dimensions and conditions prior to start of construction. Immediately contact the Authority for clarification of questionable items or apparent conflicts.

### **3.2 EXAMINATION**

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

### **3.3 CUTTING, FITTING, REPAIRING, PATCHING, AND FINISHING**

- A. Where previously completed building surfaces or other features must be cut, penetrated, or otherwise altered, such work shall be carefully laid out and patched to the original condition. Perform work only with craftsmen skilled in their respective trades.
- B. Do not cut, drill, or notch structural members unless specifically approved by the Authority. Minimize penetrations and disruption of building features.

### **3.4 INSTALLATION OF EQUIPMENT**

- A. Unless otherwise indicated, support all equipment and install in accordance with manufacturer's recommendations and approved submittals.
- B. Maintain manufacturer's recommended minimum clearances for access and maintenance.
- C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.
- D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.
- E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all apparatus furnished.

### **3.5 SCOPE OF ISOLATION AND RESTRAINT WORK**

- A. All vibrating equipment and the interconnecting pipe and ductwork shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.
- B. Mechanical equipment shall be carefully checked upon delivery for proper mechanical performance, which shall include proper noise and vibration operation.

- C. All installed rotating equipment with excessive noise and/or vibration, which cannot be corrected in place, shall be replaced at no cost to the Authority.

**END OF SECTION**

## **SECTION 23 05 29**

### **HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes:
  - 1. Pipe hangers and supports.
  - 2. Hanger rods.
  - 3. Formed steel channel.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical
- B. Section 23 21 13 - Hydronic Piping
- C. Section 23 11 13 - Fuel and Lube Oil Piping
- D. Section 23 35 16.10 - Engine Exhaust and Crank Vent Piping
- E. Section 26 05 29 - Hangers and Supports for Electrical Systems

##### **1.3 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
- B. ASTM International:
  - 1. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- C. American Welding Society:
  - 1. AWS D1.1 - Structural Welding Code - Steel.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

##### **1.4 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity. Indicate finish for interior and exterior applications.

2. Vise and Accessories: Submit manufacturers catalog data for vise and mounting bracket.

### **1.5 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Conform to applicable code for support of piping and equipment.

### **1.6 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

### **1.8 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 STRUCTURAL STEEL**

- A. Miscellaneous shapes and plate: ASTM A-36.
- B. Rectangular tubing: ASTM A-500 Grade B.
- C. Structural Pipe: ASTM A-53 or ASTM A-106B.
- D. Paint as indicated.

### **2.2 PIPE HANGERS AND SUPPORTS**

- A. Support equipment and raceways on strut, brackets, trapeze hangers, or as detailed. Anvil, B-Line, Grinnell, Unistrut, or approved equal.

### **2.3 FORMED STEEL CHANNEL**

- A. Strut: Cold formed mild steel channel strut, pre-galvanized finish and slotted back unless specifically indicated otherwise.
- B. Standard Strut: 12 gauge thick steel, 1-5/8" x 1-5/8", B-line B22-SH-Galv or equal.
- C. Double Strut: 12 gauge thick steel, 1-5/8" x 3-1/4", B-line B22A-SH-Galv or equal.
- D. Shallow Strut: 14 gauge thick steel, 1-5/8" x 13/16", B-line B54-SH-Galv or equal.
- E. Where strut is welded to tanks or structures provided plain (unfinished black) solid back strut: 12 gauge thick steel, 1-5/8" x 1-5/8", B-line B22-PLN or approved equal.

- F. On all exterior installations provide hot dip galvanized strut and fittings.

## **2.4 FITTINGS AND ACCESSORIES**

- A. Provide fittings, brackets, channel nuts, and accessories designed specifically for use with specified channel strut. Zinc plated carbon steel except for exterior installations provide hot dip galvanized.
- B. Pipe Clamps: Two piece pipe clamp designed to support pipe tight to strut, B-line as indicated on the Pipe/Tubing Strut Clamp Schedule on Sheet M1.1 or approved equal. On copper tubing provide copper plated carbon steel clamps with dielectric cushion insert. On interior steel piping provide zinc plated carbon steel clamps. On exterior steel piping provide hot dip galvanized clamps.
- C. Pipe Straps: Two-hole steel pipe strap. Zinc plated carbon steel except for exterior installations provide hot dip galvanized.

## **2.5 FASTENERS**

- A. All bolts, nuts, and washers to be zinc plated carbon steel except as specifically noted otherwise.
- B. On exterior installations provide hot dip galvanized steel bolts, nuts, and washers.
- C. On exhaust piping flanges provide plain carbon steel (black) or stainless steel bolts, nuts, and washers. Coat with high temperature anti-seize prior to assembly.
- D. Hanger Rods: Continuous threaded rod. Zinc plated carbon steel except for exterior installations provide hot dip galvanized.
- E. Provide stainless wood screws and sheet metal screws where specifically indicated on the Drawings.

## **2.6 VISE**

- A. Provide heavy duty mechanics vise with 4-point mounting 360 degree swivel base, minimum 4-3/4" throat depth, 8" wide jaws. Wilton Model 748A or approved equal.
- B. Provide heavy duty wall mount base for vise with receiver for quick removal. Trick Tools Part # RM3 Combo or approved equal.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

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

## **3.2 PREPARATION**

- A. Obtain permission from the Authority before drilling or cutting structural members.

## **3.3 INSTALLATION - EQUIPMENT**

- A. Support equipment as shown on Drawings using specified supports and fasteners.

- B. Anchor equipment weighing more than 100 pounds to the building structure to resist lateral earthquake forces.
- C. 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.
- D. 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.

### **3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Support piping as shown on Drawings using specified supports and fasteners. If not detailed on Drawings, support from structural members with pipe hangers, clamps or pipe straps specifically intended for the application.
- B. Pipe clamps and hangers for steel pipe shall be zinc plated carbon steel except on exterior installations hot dip galvanized.
- C. Copper tube shall be isolated from clamps, hangers, and strut with two layers of 10 mil vinyl pipe wrap..
- D. Independently support pumps and equipment. Do not support piping from connections to equipment.
- E. Support horizontal piping as scheduled.
- F. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- G. Place hangers within 12 inches of each horizontal elbow or as indicated.
- H. Use hangers with 1-1/2 inch minimum vertical adjustment.
- I. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- J. Support riser piping independently of connected horizontal piping.
- K. Design hangers for pipe movement without disengagement of supported pipe.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 19.

### 3.5 SCHEDULES

A. Copper Tube and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	Copper Tube Maximum Hanger Spacing (Ft)	Steel Pipe Maximum Hanger Spacing (Ft)	Copper Tube Hanger Rod Diameter (In)	Steel Pipe Hanger Rod Diameter (In)
1/2 & 3/4	5	7	3/8	3/8
1 & 1-1/4"	6	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
3	10	10	1/2	1/2
4	12	10	1/2	5/8

**END OF SECTION**

**SECTION 23 07 19**  
**PIPING INSULATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes:
  - 1. Piping insulation, jackets and accessories.
  - 2. Exhaust piping insulation, jackets and accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 21 13 – Hydronic Piping.
- D. Section 23 35 16.10 - Engine Exhaust and Crank Vent Piping.

**1.3 REFERENCES**

- A. ASTM International:
  - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 2. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
  - 3. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
  - 4. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
  - 5. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

**1.4 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

**1.5 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Pipe insulation maximum flame spread index of 25 and maximum smoke developed index of 50 in accordance with ASTM E84.

C. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

## **1.6 QUALIFICATIONS**

A. Manufacturer: Company specializing in manufacturing products specified in this section.

B. Applicator: Company specializing in performing work specified in this section.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

## **1.8 ENVIRONMENTAL REQUIREMENTS**

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

## **1.9 FIELD MEASUREMENTS**

A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 COOLANT/HEAT RECOVERY PIPE INSULATION**

A. TYPE P-1: ASTM C547, 1" preformed rigid fiberglass pipe insulation. Thermal Conductivity: 0.23 at 75 degrees F. Operating Temperature Range: 0 to 850 degrees F. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints. Jacket Temperature Limit: minus 20 to 150 degrees F. Johns-Manville "Micro-Lok" or approved equal.

### **2.2 EXHAUST PIPE INSULATION**

A. Pipe: TYPE P-2: ASTM C547, 1-1/2" preformed rigid mineral wool fiber insulation made with basalt rock and slag. Thermal Conductivity: 0.25 at 100 degrees F. Maximum Operating Temperature: 1200 degrees F. ROXUL Techton 1200 or approved equal.

B. Wall Penetrations: Where indicated on Drawings install TYPE 1 mineral wool fiber batt insulation. Rockwool Safe-N-Sound or approved equal. Fill entire void with insulation.

C. Flex Connector: Insulate engine exhaust flex connectors from turbo outlet up to and including flanged ends with custom fit high temperature thermal insulation blanket. Provide four layer system with inner stainless steel mesh, 2000°F ceramic blanket, 1000°F fiberglass blanket, and plain weave carmelized fiberglass fabric outer cover. Provide all stainless steel closure system including lacing anchors, washers, and wire. Distribution International or approved equal.

### **2.3 PIPE INSULATION JACKETS**

- A. Aluminum Pipe Jacket: ASTM B209. Exterior grade, 0.016 inch thick sheet, embossed finish.
- B. Fittings: Pre-formed aluminum covers. PABCO or approved Equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Check materials for damage that may have occurred during shipment. Repair damaged materials as required or replace with new materials.
- B. Verify piping has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.
- D. Verify piping has been painted up to areas to be insulated.

### **3.2 INSTALLATION - PIPING SYSTEMS**

- A. Install insulation in accordance with manufacturer's installation instructions.
- B. Install insulation where indicated on Drawings.
- C. Cover all piping insulation with aluminum jackets. Join with longitudinal slip joints and minimum 2 inch laps.

**END OF SECTION**

**SECTION 23 09 00**  
**INSTRUMENTATION AND CONTROL DEVICES**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section includes:
  - 1. Instrumentation Equipment
  - 2. Pressure gauges.
  - 3. Differential Pressure gauges.
  - 4. Thermometers.
  - 5. Thermometer thermowell.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 21 16 - Hydronic Equipment and Specialties.
- C. Division 26 - Electrical

**1.3 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
- B. ASTM International:
  - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
  - 2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

**1.4 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  - 1. Submit manufacturers catalog literature for each item indicated on the Instrumentation Equipment Schedule on Sheet M1.1.
  - 2. Submit manufacturers catalog literature for all instrumentation items specified herein.

**1.5 CLOSEOUT**

- A. Division 1 - Closeout Requirements

- B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.
- C. Operation and Maintenance Data: Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

## **1.6 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing Work of this section.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Accept controls on site in original factory packaging. Inspect for damage.

## **1.8 COORDINATION**

- A. Coordinate installation of control components in work of Division 26.

## **PART 2 PRODUCTS**

### **2.1 PRESSURE GAUGES**

- A. Dry type stainless steel case, tube, and socket, 1/4" NPT bottom connection, 2-1/2" dial size. Range as indicated on Drawings.
- B. Range 0-15 psi: Trerice Model 700SS-25-02-L-A-080 or approved equal.
- C. Range 0-100 psi: Trerice Model 700SS-25-02-L-A-110 or approved equal.

### **2.2 DIFFERENTIAL PRESSURE GAUGES**

- A. Diaphragm type, brass body, 1/4" FPT in-line connections, 2-1/2" size basic dial, hermetically sealed SPDT switch with terminal strip.
- B. 0-15 PSI Range: Orange Research 1516DGS-1E-2.5B-C-0-15PSID or approved equal.

### **2.3 THERMOMETERS**

- A. Digital thermometer, solar powered, LCD display, -50 to +300 F range or dual F/C range, 1% of reading accuracy, variable angle display, 3-1/2" stem length.
- B. Weiss DVU35 or approved equal.
- C. Provide all thermometers with a 3/4" NPT brass thermowell.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Check equipment for damage that may have occurred during shipment. Repair damaged equipment as required or replace with new equipment.
- B. Verify location of thermostats and other exposed control sensors with Drawings before installation.

- C. Verify building systems to be controlled are ready to operate.

### **3.2 INSTALLATION**

- A. Install instrumentation where indicated on the Drawings in accordance with manufacturer's installation instructions.
- B. Install gauges and thermometers in locations where they are clear of valve handles or other obstructions and where they can be easily read from normal operating level. Install with face within 45 degrees of vertical.
- C. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate.
- D. Isolate hydronic pressure gauges during pressure testing.
- E. Install conduit and electrical wiring in accordance with Division 26.
- F. After completion of installation, test and calibrate all instrumentation.

**END OF SECTION**

**SECTION 23 11 13**  
**POWER PLANT FUEL-OIL PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Scope: This section applies to all diesel fuel and lube oil piping systems installed above grade at the power plant including interior and exterior piping.
- B. Section includes:
  - 1. Fuel oil piping.
  - 2. Lube oil (used oil) piping.
  - 3. Fittings, Valves, and Strainers.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 11 14 - Power Plant Direct Bury Fuel Piping.
- D. Section 23 12 13 – Power Plant Fuel-Oil Equipment and Specialties.
- E. Section 26 32 13 – Engine Generators.
- F. Section 33 56 13 – Above Ground Fuel Storage Tanks.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Minimum Working-Pressure Rating: Unless otherwise indicated, minimum pressure requirement for fuel and lube oil piping is 150 psig.

**1.4 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
  - 3. ASME B16.5 Flanges and Flanged Fittings
  - 4. ASME B16.9 Factory-Made Wrought Steel Butt welding Fittings
  - 5. ASME B16.11 Forged Fittings, Socket-Welding and Threaded
  - 6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A106B – Standard Specification for Seamless Carbon Steel Pipe for High Temperature Services.
  - 2. ASME B16.11 Forged Fittings, Socket-Welding and Threaded

## **1.5 SYSTEM DESCRIPTION**

- A. Provide piping of material as specified in PART 2.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded connections to valves, equipment.
- C. Provide pipe hangers and supports per Drawings and specifications.

## **1.6 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data: Provide submittals for all products and systems described herein.
- C. Welders' Certificate: Include welders' certification of compliance in accordance with Quality Assurance below.
- D. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.

## **1.7 CLOSEOUT**

- A. Division 1 - Closeout Requirements.

## **1.8 QUALITY ASSURANCE**

- A. Division 1 – Quality Control.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

## **1.9 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing Work of this section with current certification.

## **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

## **1.11 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Materials shall be new unless otherwise specified. All items of the same type shall be of the same manufacturer.
- B. Oil pipe shall have welded joints except for threaded connections to equipment and valves as required and shown. Provide flanged joints where indicated on Drawings to allow removal of individual components.
- C. Provide butt weld joints for all pipe 1-1/2 inches in diameter and larger and on smaller pipe where specifically indicated on Drawings. Provide socket weld or threaded joints for all piping smaller than 1-1/2 inches in diameter unless indicated otherwise.
- D. Vent piping shall be galvanized with threaded joints.

### **2.2 PIPE**

- A. Oil Pipe (DFS, DFR, UOR): ASTM A106B seamless black steel pipe, Schedule 80.
- B. Vent Pipe: ASTM A53B ERW welded galvanized steel pipe, Schedule 40.

### **2.3 PIPE FITTINGS**

- A. Fittings: ASTM A234 seamless carbon steel butt weld fittings for all pipe 1-1/2 inches in diameter and larger and on smaller pipe where specifically indicated on Drawings. Provide socket weld or threaded joints for all piping smaller than 1-1/2 inches in diameter using ASTM 105, forged steel fittings, minimum 3000 lb.
- B. Flanges: ASTM A105 forged steel, ANSI 150# raised face unless indicated otherwise. Butt or socket weld as indicated.
- C. Flange Gaskets: Spiral wound metallic gaskets, Flexitallic or approved equal.
- D. Flange Bolts: On all exterior piping provide galvanized bolts, nuts, and washers.
- E. Vent pipe shall have threaded joints with minimum 300# galvanized threaded fittings.

### **2.4 BALL VALVES**

- A. Flanged Ball Valves: Reduced port, carbon steel uni-body, ANSI 150# raised face flanged ends, stainless steel ball and trim, TFM seat and PTFE seals for NACE MR0175 service, lockable handle, 150 psig minimum working pressure. PBV C-5410-31-2236-FTNL or approved equal. Note that for a substitute valve to be approved it must be a domestic manufactured high quality industrial valve such as Apollo or Nibco.
- B. Threaded Ball Valves: Carbon steel body, threaded ends, stainless steel ball and trim, PTFE seat and Graphite/PTFE seals for NACE MR0175 service, lockable handle, 150 PSIG minimum working pressure. PBV C-5312-38-2236-TL-NC, PBV C-5322-38-2236-TL-NC or approved equal. Note that for a substitute valve to be approved it must be a domestic manufactured high quality industrial valve such as Apollo or Nibco.

## **2.5 CHECK VALVES**

- A. Threaded Check Valves: Brass or bronze body, threaded ends, swing check style, 150 psig minimum working pressure. Domestic only. Hammond, Milwaukee, Nibco, or approved equal.

## **2.6 PRESSURE RELIEF VALVES**

- A. Threaded Pressure Relief Valves: Bronze body, hard seat, MPT inlet by FPT outlet, size and pressure setting as indicated on the Drawings, Kingston 103SS or approved equal.
- B. Flanged Pressure Relief Valves - Carbon steel body, 316 stainless steel internals, ANSI 150# raised face flange inlet and outlet, 1/2" orifice, buna seal, closed cap. Size and pressure setting as indicated. Taylor 82E#751717-10-10-0 or approved equal.

## **2.7 FUSIBLE VALVES**

- A. Fusible Link Valves: Brass body, FPT ends, 165°F fusible head. Firomatic or approved equal. Size as indicated on Drawings:  
1/2" Valve Model #12130, 1" Valve Model #12113.

## **2.8 SOLENOID VALVES**

- A. Normally Closed Solenoid Valves: Brass body, 1/2" FPT ends, 1/2" NPT conduit connection, 120VAC, stainless steel core, molded epoxy coil enclosure, internal pilot operated, 150 PSI differential opening pressure, liquid tight and full modulation at 0 PSI differential. Asco Catalog No. 8210G94 or approved equal.
- B. Normally Open Solenoid Valves: Brass body, 1/2" FPT ends, 1/2" NPT conduit connection, 120VAC, stainless steel core, molded epoxy coil enclosure, internal pilot operated, 150 PSI differential closing pressure, liquid tight and full modulation at 0 PSI differential. Asco Catalog No. 8210G34 or approved equal.

## **2.9 STRAINERS**

- A. Threaded Y Strainer: Type Y pattern, bronze body, screwed ends, gasketed cap, 20 mesh stainless steel screen. 200 psig minimum working pressure. Mueller No. 351 or approved equal.
- B. Flanged Y Strainer: Type Y pattern, carbon steel body, ANSI 150# raised face flanged ends 200 PSIG minimum working pressure. Mueller #781 or approved equal.
- C. Flanged Basket Strainer: Basket type, carbon steel body, ANSI 150# raised face flanged ends 150 PSIG working pressure, quick knob top with O-ring, 0.062 mesh stainless steel screen. Mueller #125F-CS or approved equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- A. Ream threaded pipe ends and remove burrs. Remove scale and dirt, on inside and outside, before assembly.
- B. Thoroughly coat male pipe ends with Teflon tape and Teflon pipe joint compound prior to assembling.
- C. Coat flange gaskets and bolts with anti-seize compound prior to assembling joints.

### **3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Install pipe hangers and supports in accordance with Drawings and Section 23 05 29.

### **3.4 INSTALLATION - PIPING**

- A. Route piping in orderly manner and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space. Group piping whenever practical at common elevations.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Install valves with stems upright or horizontal, not inverted. Provide access where valves are not exposed.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- F. Prepare and paint pipe, fittings, supports, and accessories not pre-finished in accordance with Section 23 05 00.
- G. Install identification on piping systems in accordance with Section 23 05 00.

### **3.5 FUEL AND LUBE OIL PIPING TESTING AND REPORTING**

- A. Division 1 – Quality Control
- B. Test all oil piping with minimum 125 psig air. Test 100% of welds visually for leaks with each joint soaked in a foaming soapy water solution, and visually inspect each joint for leaks. Isolate and pressure test each run of piping for a minimum of one hour. Provide blind flanges, threaded caps or plugs at each end of the test section as needed. Do not conceal pipe joints before pressure testing is complete. Isolate equipment and components rated for lesser pressures so as not to damage these items.
- C. Pressure test piping system again after all equipment is installed at 50 psi for a minimum of one hour, or the maximum rated pressure of the weakest component, whichever is less.
- D. Notify the Authority in writing seven (7) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Pressure testing performed without the Authority present may be rejected unless prior written approval is received from the Authority.

- E. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- F. Submit certified test results to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

**3.6 SYSTEM STARTUP**

- A. Prime equipment and piping prior to testing and verify operation as indicated in Section 23 12 13.

**END OF SECTION**

**SECTION 23 11 14**  
**POWER PLANT DIRECT BURY FUEL PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Scope: This section applies to all diesel fuel piping installed below grade at the power plant.

**1.2 RELATED SECTIONS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 11 13 - Power Plant Fuel-Oil Piping.
- C. Section 31 23 33 - Trenching and Backfill For Utilities.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Minimum Working-Pressure Rating: Unless otherwise indicated, minimum pressure requirement for fuel and lube oil piping is 150 psig.

**1.4 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
  - 3. ASME B16.5 Flanges and Flanged Fittings
  - 4. ASME B16.9 Factory-Made Wrought Steel Butt welding Fittings
  - 5. ASME B16.11 Forged Fittings, Socket-Welding and Threaded
  - 6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A106B – Standard Specification for Seamless Carbon Steel Pipe for High Temperature Services.
  - 2. ASME B16.11 Forged Fittings, Socket-Welding and Threaded

**1.5 SYSTEM DESCRIPTION**

- A. Provide piping, coating, anodes, and accessories as specified in PART 2.
- B. Install in accordance with Drawings and specifications.

**1.6 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data: Provide submittals for all products and systems described herein.

- C. Welders' Certificate: Include welders' certification of compliance in accordance with Quality Assurance below.
- D. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.

### **1.7 CLOSEOUT**

- A. Division 1 - Closeout Requirements.

### **1.8 QUALITY ASSURANCE**

- A. Division 1 – Quality Control.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

### **1.9 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing Work of this section with current certification.

### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Store coatings and accessories in accordance with manufacturer's requirements.
- B. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

### **1.11 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Materials shall be new unless otherwise specified.
- B. Pipe shall have butt welded joints. Provide dielectric flanged joints where indicated on Drawings to isolate from above grade piping.

### **2.2 PIPE AND FITTINGS**

- A. Pipe: ASTM A106B seamless black steel pipe, Schedule 80.
- B. Fittings: ASTM A234 seamless carbon steel butt weld fittings, heavy bore/extra heavy.
- C. Flanges: ASTM A105 forged steel, ANSI 150# raised face unless indicated otherwise. Butt or socket weld as indicated.
- D. Dielectric Flange: Provide complete isolation kit including gasket, sleeves, and washers. Flexitallic Isoflex or approved equal.
- E. Flange Bolts: Provide galvanized bolts, nuts, and washers.

### **2.3 PIPE SHOP COATING**

- A. All straight pipe for buried installation shall be shop coated prior to mobilizing to project.
- B. Perform all coating in accordance with manufacturer's instructions including preparation, environmental conditions, and time limits between coats.
- C. Sandblast straight pipe in accordance with SSPC-SP-10 and coat within 4 hours of sandblasting.
- D. Mask 4" of each end for field welding.
- E. Coat with two-part liquid epoxy, 3M Scotchkote 323 or approved equal, to 25 mils minimum thickness.

### **2.4 ANODES**

- A. Provide 17# magnesium anodes with galvanized steel core and 20' long #10 solid copper lead wire in bentonite filled bag. Norton Corrosion or approved equal.

### **2.5 HEAT SHRINK**

- A. Provide mastic lined heat shrink tape. Raychem Flexclad or approved equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 EXCAVATION AND BACKFILL**

- A. Perform all excavation, bedding, and backfill in accordance with Section 31 23 33 - Trenching and Backfill For Utilities.
- B. Bury at depth indicated on the Drawings using specified bedding material.
- C. Install metallic locator/warning tape over pipe as indicated on the Drawings.

### **3.3 PREPARATION**

- A. After cutting pipe to length grind back epoxy coating prior to welding.

### **3.4 PRESSURE TESTING**

- A. Install and test per Section 23 11 13 - Fuel and Lube Oil Piping. Provide temporary blind flanges as required for testing.
- B. Do not coat pipe joints and fittings until installation and pressure test has been accepted.

### **3.5 ANODE INSTALLATION**

- A. Install anodes at locations indicated on Drawings in accordance with details.
- B. Wire brush a patch of bare pipe to clean near-white then cadweld lead wire. Route lead wire flat against pipe onto adjacent coating to allow sealing with heat shrink.

### **3.6 JOINT AND FITTING COATING**

- A. Wire brush all bare metal including weld areas and fittings to remove rust and scale, and slag. Inspect adjacent epoxy coating and grind off any damaged or heat affected areas and feather edges. Trim edges of existing HDPE coating to create smooth transition from new work to sound existing coating.
- B. Pre-heat pipe to 10°F minimum above ambient temperature.
- C. Wrap all bare metal with heat shrink. Spiral wrap with minimum 1" overlap. Extend coating 6" minimum onto adjacent dielectric coating and minimum 6" above grade.
- D. Slowly and evenly heat material to melt mastic underlayment and contract the heat shrink material.
- E. Heat shrink tape to form a continuous watertight covering from sound pipe coating to above grade.

### **3.7 DIELECTRIC FLANGE INSTALLATION**

- A. Install dielectric flange isolation kits at locations indicated on the Drawings. Install all components to ensure complete dielectric isolation.
- B. Ensure that any above grade piping between the ground and the isolating flange does not make contact with any structure or grounded equipment including pipe supports.

**END OF SECTION**

## **SECTION 23 12 13**

### **POWER PLANT FUEL-OIL EQUIPMENT AND SPECIALTIES**

#### **PART 1 – GENERAL**

##### **1.1 SUMMARY**

- A. Scope: This section applies to all fuel and lube oil piping systems.
- B. Section Includes:
  - 1. Fuel and Lube Oil System Equipment.
  - 2. Day Tank, Hopper, and Filter.
  - 3. Hoses and Flexible Connectors.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 11 13 – Power Plant Fuel-Oil Piping.
- D. Division 26 – Electrical.
- E. Section 33 56 13 – Above Ground Fuel Storage Tanks.

##### **1.3 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  - 1. Submit manufacturers catalog literature for each item indicated on the Fuel System Equipment Schedule on Sheet M1.1.
  - 2. Submit manufacturer's catalog information for hoses, hose fittings, flexible connectors, and all other items specified herein.
- C. Shop Drawings: Submit shop drawings for fabrication of day tank, hopper, and filter bank. Note that if all items will be fabricated exactly as indicated on the Drawings, the design Drawings can be submitted in lieu of shop drawings
- D. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.

##### **1.4 CLOSEOUT**

- A. Division 1 - Closeout Requirements.
- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

## **PART 2 – PRODUCTS**

### **2.1 DIESEL FUEL SYSTEM EQUIPMENT**

- A. Provide pumps, meters, gauges, filters, equipment, and appurtenances as indicated in the Fuel System Equipment Schedule on Sheet M1.1.
- B. Filter: Provide spare filter elements, type and quantity as indicated in the Fuel System Equipment Schedule on Sheet M1.1.

### **2.2 DAY TANK, HOPPER, AND FILTER BANK**

- A. Day Tank: Rectangular heavy gauge welded steel tank, capacity and configuration as indicated, manufactured in accordance with UL standard 142 and Drawings. Furnish and install all accessories as indicated.
- B. Hopper: Welded steel assembly manufactured as shown on Drawings. Furnish and install all accessories as indicated.
- C. Filter Bank: Welded steel assembly manufactured as shown on Drawings. Furnish and install all accessories as indicated.

### **2.3 HOSES**

- A. Fuel rated hose, Eaton Weatherhead H569, Aeroquip FC300, or approved equal. Sized as indicated on Drawings. Provide re-useable plated steel straight JIC swivel ends with NPT adapters.

### **2.3 FLEXIBLE CONNECTORS**

- A. Corrugated 321 stainless steel hose with single layer of Type 304 stainless steel wire double braided outer shield. Schedule 80 MPT or ANSI 150lb. flanged ends (fixed or floating as indicated on Drawings), 125 psig minimum working pressure, diameter and live (hose) or overall length as indicated on Drawings. Furnish with certification of minimum 125 psig pressure test. Penflex PW721, Alaska Rubber, or approved equal.

### **2.4 VENT CAP**

- A. Vent: Aluminum body, stainless steel screen, FPT connection, size as indicated. Morrison Figure 155 or approved equal.

### **2.5 QUICK CONNECT COUPLINGS**

- A. Quick Connect coupling: Aluminum body cam and groove fitting with dust cap. Male fitting with ANSI 150-pound class flanged connection, as shown, 150 psig minimum working pressure. PT Coupling or approved equal.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

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

### **3.3 FABRICATED TANKS TESTING AND REPORTING**

- A. Division 1 – Quality Control.
- B. Pressure test all tanks as indicated on the tank fabrication drawings.
- C. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.
- D. Notify the Authority in writing seven (7) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Pressure testing performed without the Authority present may be rejected unless prior written approval is received from the Authority.
- E. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- F. Submit certified test results to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

### **3.4 INSTALLATION**

- A. Install pumps and associated equipment in accordance with Drawings and manufacturer's installation instructions.
- B. Install fuel oil day tank, hopper, and filter bank as indicated on Drawings.
- C. Electrical installation shall be in accordance with Division 26 Specifications.

### **3.5 SYSTEM STARTUP**

- A. Prior to starting fuel and oil pumps, prime cavities with lube oil then energize momentarily to verify proper rotation.
- B. Prime all piping and fill filters with diesel fuel then bleed off air prior to starting pumps.
- C. Verify operation of all day tank and blender controls including timers and level alarms.

**END OF SECTION**

**SECTION 23 21 13**  
**HYDRONIC PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Scope: This section applies to all hydronic (glycol) piping systems.
- B. Section includes:
  - 1. Coolant (engine cooling) piping.
  - 2. Heat recovery piping.
  - 3. Unions and flanges.
  - 4. Valves and strainers.
  - 5. Engine coolant (ethylene glycol).
  - 6. Heat recovery fluid (propylene glycol).

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 - Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 07 19 - Piping Insulation
- D. Section 23 21 16 - Hydronic Specialties.
- E. Section 26 32 13 - Engine Generators.
- F. Section 33 61 14 - PEX Arctic Pipe.
- G. Section 33 61 24 - Steel Arctic Pipe.

**1.3 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
  - 2. ASME B16.4 - Gray Iron Threaded Fittings.
  - 3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - 4. ASME B31.1 - Power Piping.
  - 5. ASME B31.9 - Building Services Piping.
  - 6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A53B - Standard Specification for Pipe, Steel, Black and Hot-Dipped.

2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- C. American Welding Society:
  1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  2. AWS D1.1 - Structural Welding Code - Steel.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
  1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

#### **1.4 SYSTEM DESCRIPTION**

- A. Provide piping system types as indicated on the Drawings.
- B. Where copper tubing connects to steel piping provide connections as detailed on Drawings.
- C. Provide flanges, unions, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment connections.
- D. Provide pipe hangers and supports in accordance with Drawings and specifications.
- E. Use ball valves or butterfly valves for shut-off and to isolate equipment where indicated.
- F. Use gauge cock isolation valves to isolate instrumentation and small devices where indicated.
- G. Use hose end drain valves with cap for drains where indicated.
- H. Flexible Connectors: Use flexible connectors and hoses where indicated.

#### **1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  1. Piping: Submit data on pipe materials, fittings, and accessories.
  2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
  3. Glycol: Submit manufacturers catalog information for ethylene glycol solution for engine cooling service and propylene glycol solution for heat recovery service.
- C. Welders' Certificate: Include welders' certification of compliance in accordance with Quality Assurance below.
- D. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.

#### **1.6 CLOSEOUT**

- A. Division 1 - Closeout Requirements

### **1.7 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Perform Work in accordance with ASME B31.1 and ASME B31.9 code for installation of piping systems.
- C. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

### **1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Fabricator or Installer: Company specializing in performing Work of this section with current certification.

### **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- D. Store glycol solution in sealed containers clearly marked by product type.

### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 COOLANT PIPING**

- A. Steel Piping: Provide schedule 40 ASTM A106B, seamless black steel pipe with butt weld joints for engine cooling piping as specifically indicated on the Drawings.
  - 1. Fittings: ASTM A234 seamless carbon steel butt weld fittings for all pipe 2 inches in diameter and larger and on smaller pipe where specifically indicated on Drawings. Provide ASTM 105, forged steel fittings, minimum 3000 lb. socket weld or threaded fittings for connections as indicated.
  - 2. Flanges: ASTM A105 forged steel, ANSI 150# flat face unless indicated otherwise. Butt or socket weld as indicated.
  - 3. Flange Gaskets: Spiral wound metallic gaskets, Flexitallic or approved equal.
  - 4. Flange Bolts: On all exterior piping provide galvanized bolts, nuts, and washers.
  - 5. Unions: ASTM A105 forged steel threaded unions, Class 3000 minimum.
- B. Copper Piping: Provide ASTM B88, Type L drawn copper tubing with solder or threaded joints for engine cooling piping as specifically indicated on the Drawings.

1. Fittings: ASME B16.22 solder wrought copper.
2. Joints: soldered with 95-5 tin-antimony solder or silver solder except on tee drill connections use copper brazing rod.
3. Unions: Bronze unions with solder ends except where specifically indicated as threaded.

## **2.2 HEAT RECOVERY PIPING**

- A. Provide ASTM B88, Type L drawn copper tubing with solder or threaded joints.
  1. Fittings: ASME B16.22 solder wrought copper.
  2. Joints: soldered with 95-5 tin-antimony solder or silver solder except on tee drill connections use copper brazing rod.
  3. Flanges: Provide ANSI 150# companion flanges for transition to steel piping or flanged valves and equipment. Flanges to be two-piece with powder coated steel flange and solder copper tube adapter, Nibco 672 or approved equal.
  4. Flange Gaskets: Spiral wound metallic gaskets, Flexitallic or approved equal.
  5. Unions: Bronze unions with solder ends except where specifically indicated as threaded.

## **2.3 BUTTERFLY VALVES**

- A. Lug style ductile or cast iron body, ANSI 150# flange pattern ends, stainless steel stem with bronze bushing, bronze or nylon coated ductile iron disc, EPDM seats, locking handle. Milwaukee ML-233E, Bray Series 31, or approved equal.

## **2.4 BALL VALVES**

- A. Threaded or soldered end as indicated and required, bronze body, chrome plated bronze or brass ball, full port, TFE or Viton packing and seat ring, minimum 200 psig WOG rating. Domestic only. Apollo, Hammond, Milwaukee, Nibco, or approved equal.

## **2.5 CHECK VALVES**

- A. Threaded or soldered end as indicated and required, bronze body, swing check style, minimum 200 psig WOG rating. Domestic only. Hammond, Milwaukee, Nibco, or approved equal.

## **2.6 DRAIN VALVES**

- A. Bronze body, 1/2" or 3/4" size and solder cup or MPT connection to match associated pipe connection, 3/4" male hose end with cap and jack chain. FNW 426D, 426F, 427D, or 427F or approved equal.

## **2.7 GAUGE COCK ISOLATION VALVE**

- A. Brass body, MPT by FPT ends, T-handle, Legend Valve item 101-531 (1/4") or Item 101-532 (3/8"), or approved equal.
- B. Install on all pressure gauges, small hose connections, and where indicated on Drawings.

## 2.8 STRAINERS

- A. Type Y pattern, bronze body, solder ends, gasketed cap, 20 mesh stainless steel screen. 200 psig minimum working pressure, Mueller No. 358S or approved equal.

## 2.9 ENGINE COOLANT (ETHYLENE GLYCOL)

- A. Glycol Solution for Engine Cooling Service: The glycol shall be extended life (heavy duty) ethylene glycol, Shell Rotella ELC, Chevron Delo ELC, or approved equal. Note that standard life coolant will not be accepted.
- B. The solution shall be premixed to a ratio of 50% ethylene glycol to 50% water. The water shall be treated in accordance with glycol manufacturer's recommendations. The mixed solution shall be **dyed bright pink or light red**, no exceptions.
- C. The solution shall be packaged in sealed 55 gallon drums and labeled "Ethylene Glycol" with red lettering.
- D. Furnish a minimum of 3 each 55 gallon drums of ethylene glycol solution for Nikolai.
- E. Furnish a minimum of 3 each 55 gallon drums of ethylene glycol solution for Venetie.

## 2.10 HEAT RECOVERY FLUID (PROPYLENE GLYCOL)

- A. Glycol Solution for Heat Recovery Service: The glycol shall be extended life (heavy duty) propylene glycol, Safe-T-Therm HD, Dowfrost HD, or approved equal. Note that standard life propylene glycol will not be accepted.
- B. The solution shall be premixed to a ratio of 50% propylene glycol to 50% water. The water shall be treated in accordance with glycol manufacturer's recommendations. The mixed solution shall be **dyed bright yellow**, no exceptions.
- C. The solution shall be packaged in sealed 55-gallon drums and labeled "Propylene Glycol" with yellow lettering.
- D. Furnish a minimum of 4 each 55 gallon drums of propylene glycol solution for Nikolai.
- E. Furnish a minimum of 1 each 55 gallon drum of propylene glycol solution for Venetie.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Ream pipe ends and remove burrs. Remove scale and dirt, on inside and outside, before assembly.
- B. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

- C. On copper tube and solder fittings mechanically clean to bright metal and flux prior to assembling.
- D. On threaded pipe and fittings thoroughly coat male threads with Teflon tape and Teflon based pipe joint compound prior to assembling.
- E. Coat flange gaskets and bolts with anti-seize compound prior to assembling joints.

### **3.3 INSTALLATION**

- A. Route piping in orderly manner and slope to drain at low points and vent at high points.
- B. Install pipe hangers and supports in accordance with Section 23 05 29.
- C. Install piping to conserve building space and not interfere with use of space. Group piping whenever practical at common elevations.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Install valves with stems upright or horizontal, not inverted. Provide access where valves are not exposed.
- F. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- G. Prepare and paint piping, supports, and accessories not pre-finished in accordance with Section 23 05 00.
- H. Insulate piping in accordance with Section 23 07 19.
- I. Install identification on piping systems in accordance with Section 23 05 00.

### **3.4 HYDRONIC PIPING TESTING AND REPORTING - GENERAL**

- A. Division 1 – Quality Control
- B. This applies to all coolant and heat recovery piping. See paragraphs that follow for specific system requirements.
- C. Notify the Authority in writing seven (7) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Pressure testing performed without the Authority present may be rejected unless prior written approval is received from the Authority.
- D. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- E. Submit certified test results to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

### **3.5 COOLANT PIPING TESTING**

- A. Division 1 – Quality Control

- B. Hydrostatically test all piping at 100 psig minimum for one hour with no noticeable water leaks or pressure drops except as caused by temperature change.
- C. Isolate engines, radiators, and pressure gauges prior to pressure testing.

### **3.6 COOLANT SYSTEM FLUSHING**

- A. Install conical “witch hat” strainers on inlets to radiators. Orient “witch hat” to collect debris inside cone.
- B. Fill the entire system with potable water and flush. Run engines long enough with adequate load to get thermostats open and to circulate water through all piping and accessories. To ensure engines are not damaged, do not run under high load or for extended periods of time with potable water.
- C. Drain system completely. Remove “witch hat” strainers.

### **3.7 COOLANT SYSTEM FILLING**

- A. After pressure testing and flushing, fill entire system with ethylene glycol solution. Perform all functional testing of the power plant required by the Contract Documents. Ensure that engines are operated long enough with adequate load to get thermostats fully open and to circulate glycol through all piping and accessories.
- B. Operate control room heating system to ensure it is fully charged with glycol.
- C. Verify proper function of all instrumentation and calibrate all devices.
- D. Verify glycol level in expansion tank is between 1/2 and 2/3 at normal operating temperature.
- E. Transfer excess ethylene glycol solution into glycol storage tank until 95% full. Store any excess ethylene glycol solution in the original drums sealed for long-term storage. Verify that drums are clearly labeled "Ethylene Glycol" with pink lettering.

### **3.8 HEAT RECOVERY INTERIOR PIPING TESTING**

- A. Division 1 – Quality Control
- B. This applies to all interior heat recovery piping. Separately test exterior arctic pipe as indicated in paragraph that follows.
- C. Hydrostatically test all piping at 100 psig minimum for one hour with no noticeable water leaks or pressure drops except as caused by temperature change.
- D. Isolate pressure gauges prior to pressure testing.

### **3.9 HEAT RECOVERY EXTERIOR PIPING TESTING**

- A. Division 1 – Quality Control
- B. This applies to all exterior heat recovery arctic piping.
- C. Upon completion of arctic pipe installation and prior to insulating and covering joints, pressure test all PEX crimp joints and steel weld joints. Pressurize arctic pipe with

minimum 20 psig air, soak each joint with a foaming soapy water solution, and visually inspect each joint for leaks.

### **3.10 HEAT RECOVERY SYSTEM FLUSHING**

- A. After testing arctic pipe, isolate arctic pipe from interior piping.
- B. Flush interior piping and equipment with potable water and drain or blow out with air to remove all water. Install temporary pipe or hose jumpers as required.

### **3.11 HEAT RECOVERY SYSTEM FILLING - NIKOLAI**

- A. After pressure testing and flushing, bleed air reservoir on the expansion tank in the power plant as required to maintain 10 psig residual with the system empty. Fill the entire heat recovery system including power plant piping, arctic pipe, and end user building piping with propylene glycol solution to 20 psig minimum with system cold. Vent air from all high point vents prior to starting circulating pumps.
- B. Cycle pumps on and off and vent high points until all air has been purged from the piping. Add propylene glycol solution as required to maintain 20 psig minimum with system cold. When the system comes up to normal temperature (170°F minimum) add propylene glycol solution as required to bring system pressure to 30 psig minimum at expansion tank.
- C. Verify proper function of all instrumentation and calibrate all devices.
- D. Perform complete functional testing of the heat recovery system including control devices and energy meters.
- E. Store any excess propylene glycol solution in the original drums sealed for long-term storage. Verify that drums are clearly labeled "Propylene Glycol" with yellow lettering.

### **3.12 HEAT RECOVERY SYSTEM FILLING - VENETIE**

- A. Deliver drum of propylene glycol to the Sanitation Facility mechanical room and perform all filling through the sanitation facility glycol makeup system. Continuously monitor the level in the glycol mix tank and add glycol as required to maintain pressure in the system.
- B. Fill the new arctic piping and the power plant heat recovery system by slowly opening the branch valves at the tees connecting to the main utilidor. Open the valves one at a time and allow the glycol to push all air to the high points in the power plant. Vent air from all high point vents prior to starting circulating pumps.
- C. Cycle pumps on and off and vent high points until all air has been purged from the piping. When the system comes up to normal temperature (170°F minimum) add propylene glycol solution as required to bring system pressure to 10 psig minimum at the suction side of pump P-HR1B in the power plant.
- D. Verify proper function of all instrumentation and calibrate all devices.
- E. Perform complete functional testing of the heat recovery system including controls.

- F. Store any excess propylene glycol solution in the original drum sealed for long-term storage in the Sanitation Facility. Verify that drum is clearly labeled "Propylene Glycol" with yellow lettering.

**END OF SECTION**

**SECTION 23 21 16**  
**HYDRONIC EQUIPMENT AND SPECIALTIES**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Scope: This section applies to all hydronic (glycol) piping systems.
- B. Section includes:
  - 1. Engine Cooling System Equipment.
  - 2. Heating Recovery and Plant Heating Equipment.
  - 3. Expansion tank sight gauge and cap.
  - 4. Hoses.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 21 13 - Hydronic Piping.
- D. Division 26 – Electrical.

**1.3 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  - 1. Submit manufacturers catalog literature including manufacturer's installation instructions for each item indicated on the Cooling System Equipment Schedule and the Heat Recovery & Plant Heating Equipment Schedule on Sheet M1.1.
  - 2. Submit manufacturer's catalog information for appurtenances, hoses, hose clamps, and all other items specified herein.
- C. Shop Drawings: Submit shop drawings for glycol storage and expansion tank fabrication. Note that if all items will be fabricated exactly as indicated on the Drawings, the design Drawings can be submitted in lieu of shop drawings.

**1.4 CLOSEOUT**

- A. Division 1 - Closeout Requirements.
- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

## **1.5 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing Work of this section.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept material on site in shipping containers with labeling in place. Inspect for damage.
- B. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

## **1.7 ENVIRONMENTAL REQUIREMENTS**

- A. Division 1 – Material and Equipment: Storage and Protection.

## **1.8 FIELD MEASUREMENTS**

- A. Verify field measurements before fabrication.

## **PART 2 - PRODUCTS**

### **2.1 COOLING SYSTEM EQUIPMENT**

- A. Provide all equipment and appurtenances as indicated in the Cooling System Equipment Schedule on Sheet M1.1.
- B. Glycol Storage and Expansion Tanks - Welded steel assemblies manufactured as shown on Drawings. Furnish and install all accessories as indicated.

### **2.2 HEAT RECOVERY & PLANT HEATING SYSTEM EQUIPMENT**

- A. Provide all equipment and appurtenances as indicated in the Heat Recovery & Plant Heating Equipment Schedule on Sheet M1.1.

### **2.3 LIQUID LEVEL SIGHT GAUGE**

- A. Borosilicate glass tube, aluminum body, Buna n seals, 1/2" MPT connections, 9" centers. Lube Devices G607-09-A-1-4 or approved equal.

### **2.4 EXPANSION TANK CAP**

- A. Fabricated fitting, filler neck by 2" MPT with 3/8" hose barb vent, Alaska Rubber Part# IV8017SS3231308 or approved equal. Furnish with 7 PSI pressure cap.

### **2.5 HOSES**

- A. Wire reinforced corrugated silicone hose. Parker 6621, Tusil Radflex, or approved equal. Sized as indicated on the Drawings.
- B. Install on barbed hose (king) nipples. On hoses larger than 1" install with stainless steel T-bolt clamps, Ideal-Tridon 30051 or approved equal. On hoses 1" and smaller install with lined stainless steel constant torque clamps, Ideal-Tridon 47 or approved equal.

- C. On expansion tank vent discharge install nylon reinforced silicone heater hose, Flexfab 5526 or approved equal.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

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

#### **3.2 PREPARATION**

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

#### **3.3 FABRICATED TANKS TESTING AND REPORTING**

- A. Division 1 – Quality Control.
- B. Pressure test all tanks as indicated on the tank fabrication drawings.
- C. Submit written procedures for testing, including test pressures, equipment to be used and items to be tested.
- D. Notify the Authority in writing seven (7) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Pressure testing performed without the Authority present may be rejected unless prior written approval is received from the Authority.
- E. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- F. Submit certified test results to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

#### **3.4 INSTALLATION**

- A. Install equipment and accessories in strict compliance with manufacturer's instructions.
- B. Install piping system and appurtenances as indicated on Drawings.

#### **3.5 CLEANING**

- A. Clean and flush glycol system before adding glycol solution. See Section 23 21 13 - Hydronic Piping.

**END OF SECTION**

**SECTION 23 31 13**  
**METAL DUCTS AND VENTILATION EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes:
  - 1. Duct Materials.
  - 2. Fans.
  - 3. Dampers.
  - 4. Actuators.
  - 5. Filters.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Division 26 – Electrical.

**1.3 REFERENCES**

- A. ASTM International:
  - 1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. Air Movement and Control Association International, Inc.: AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- C. National Fire Protection Association: NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- D. Sheet Metal and Air Conditioning Contractors: SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission.

**1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.

- B. Product Data:
  - 1. Submit data for duct materials and accessories.
  - 2. Submit manufacturers catalog literature for each item indicated on the Ventilation Equipment Schedule on Sheet M1.1.
- C. Shop Drawings: Submit shop drawings for fabrication of ductwork. Note that if ductwork will be fabricated exactly as indicated on the Drawings, the design Drawings can be submitted in lieu of shop drawings.

## **1.6 CLOSEOUT**

- A. Division 1 - Closeout Requirements.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

## **1.7 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible and International Mechanical Code.

## **1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing work of this section.

## **1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

## **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication as required.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Galvanized Steel: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having zinc coating in conformance with ASTM A90.
- B. Aluminum: Type 5052 alloy, minimum 0.090” thick.
- C. Fasteners: Rivets, bolts, or sheet metal screws except where indicated as welded.
- D. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.

## **2.2 FABRICATION**

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on the Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Fabricate assemblies from galvanized steel or aluminum as indicated on the Drawings. Galvanized sheet metal assemblies shall have standard mechanical joints sealed airtight. Aluminum assemblies shall have continuous welded joints. Grind weld joints smooth after fabrication.
- C. Exterior Hood Fabrications: Fabricate all exterior hoods from minimum 0.090" thick Type 5052 aluminum using welded joints.
- D. Provide stainless steel mesh and frames where indicated on the Drawings.

## **2.3 CONTROL DAMPER**

- A. Opposed blade low-leakage control damper, airfoil blades, galvanized steel construction, acetal bearings, stainless steel jamb seals, TPE blade seals. Greenheck VCD-33 or approved equal. See fabrication details on Drawings for sizes.

## **2.4 ACTUATORS**

- A. On duct dampers install multi-voltage spring return actuator, Belimo AFBUP or approved equal.

## **2.5 FILTERS**

- A. High capacity pleated panel filter, MERV 8 rating. Camfill 30/30 or approved equal. See fabrication details on Drawings for sizes.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Check equipment for damage that may have occurred during shipment. Repair damaged equipment as required or replace with new equipment.
- B. Verify sizes of equipment connections before fabricating transitions.

### **3.2 INSTALLATION**

- A. Fabricate and install ducts as indicated on Drawings and in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Verify proper rotation and operation of fans. Adjust actuators to achieve damper full open to full close operation.
- C. Provide two complete sets of filters for all intake ducts new in boxes and package with modules for field installation by others.

**END OF SECTION**

## **SECTION 23 35 16**

### **ENGINE EXHAUST, CRANK VENT, AND CHARGE AIR SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes:
  - 1. Engine Exhaust Piping and Accessories.
  - 2. Crank Vent Piping and Accessories.
  - 3. Charge Air Tubing and Accessories.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 07 19 - Piping Insulation.
- D. Section 26 32 13 – Engine Generators.

##### **1.3 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 –
  - 2. Power Piping.
  - 3. ASME B31.9 - Building Services Piping.
  - 4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A53B - Standard Specification for Pipe, Steel, Black and Hot-Dipped.
- C. Underwriters Laboratories Inc.:
  - 1. UL 536 - Flexible Metallic Hose.

##### **1.4 SYSTEM DESCRIPTION**

- A. Provide piping of material as specified in PART 2.
- B. Where more than one piping system material is specified, provide compatible system components and joints.
- C. Provide flanges or couplings at locations requiring servicing and where indicated. Do not use direct welded connections to equipment.
- D. Provide pipe hangers and supports per Drawings and specifications.

- E. Flexible Connector: Use at exhaust piping connections to engine as indicated in Drawings.

### **1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data. Submit manufacturer's catalog information for the following:
  - 1. Exhaust Piping: Both carbon steel and stainless steel as indicated.
  - 2. Crank Vent Piping: Both carbon steel and stainless steel as indicated.
  - 3. Charge Air Piping: Light wall carbon steel tubing.
  - 4. Pipe and Tubing Fittings.
  - 5. Flanges and Gaskets
  - 6. Mufflers.
  - 7. Rain Caps.
  - 8. Thimbles.
  - 9. Charge Air Flex Connectors and Clamps.
  - 10. Crank Vent Hose and Clamps.
- C. Shop Drawings: Submit shop drawings for crank vent condensate trap fabrication. Note that if items will be fabricated exactly as indicated on the Drawings, the design Drawings can be submitted in lieu of shop drawings.
- D. Welders' Certificate: Include welders' certification of compliance in accordance with Quality Assurance below.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Division 1 - Closeout Requirements.

### **1.7 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

### **1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Fabricator or Installer: Company specializing in performing Work of this section.

## **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Division 1 - Material and Equipment: Transportation and Handling.
- B. Accept piping and materials on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

## **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 - PRODUCTS**

### **2.1 EXHAUST PIPING**

- A. Interior Exhaust Pipe (riser from engine to muffler): ASTM A53 welded black steel pipe, Schedule 40, with ASTM A235 seamless carbon steel butt weld fittings and ASTM A105 weld flanges. Note that at Contractors option interior piping may be stainless equivalent to exterior.
- B. Exterior Exhaust Pipe: ASTM A312 Type 304L welded low carbon stainless steel pipe, Schedule 10, with ASTM A403 Type 304L low carbon stainless steel butt weld fittings and ASTM A182 weld flanges.

### **2.2 CRANK VENT PIPING**

- A. Interior Crank Vent Pipe: ASTM A106B black steel pipe, Schedule 40, with ASTM A105 socket weld fittings. Note that at Contractors option interior piping may be stainless equivalent to exterior.
- B. Exterior Crank Vent Pipe: ASTM A312 Type 304L welded low carbon stainless steel pipe, Schedule 40, with ASTM A403 Type 304L low carbon stainless steel butt weld fittings and ASTM A182 weld flanges.

### **2.3 CHARGE AIR TUBING**

- A. Light wall carbon steel O.D. tubing with butt weld joints and fittings. IAC Acoustics or approved equal.

### **2.4 FLANGED JOINTS**

- A. Exhaust Flanges: ANSI 150#, flat faced, slip-on weld flanges.
- B. Exhaust Flange Bolts: Plain carbon steel (black) bolts, nuts, and washers. Coat with high temperature anti-seize prior to assembly.
- C. Charge Air Flanges: 1/2" thick steel plate, ANSI 150# pattern for O.D. and bolting, I.D. sized for tubing insert connection.
- D. Charge Air Flange Bolts: Hot dip galvanized bolts, nuts, and washers. Coat with high temperature anti-seize prior to assembly.

- E. Flange Gaskets: Full face, rated for minimum 1000F continuous. Garlock 4122-FC, Metal Tech HT-195, or approved equal.

## **2.5 MUFFLERS**

- A. Mufflers to be disc style, bottom center in and side out, ASA 125# flanges, 2" internal acoustical/thermal wrap, high temperature satin black finish. Configure with four mounting tabs at bottom. Mufflers shall be critical grade with minimum 28db reduction at 125Hz. G.T. Exhaust Systems H1-5, Harco CFH, Miratech DCK, or approved equal. See Drawings for size.

## **2.6 RAIN CAPS**

- A. Exhaust rain caps, hinged type, all stainless steel construction, G.T. Exhaust Systems or approved equal. See Drawings for size.

## **2.7 THIMBLES**

- A. Exhaust Thimbles: Stainless steel, triple-wall, insulated, ventilated, and listed for zero clearance to combustibles, HARCO WT-47 Series, or approved equal. Configure as detailed on the Drawings.
- B. Charge Air Thimbles: Stainless steel, double-wall, insulated, HARCO or approved equal. Configure as detailed on the Drawings.

## **2.8 FLEXIBLE CONNECTORS**

- A. Exhaust Pipe Flexible Connectors: Furnished with Engine Generator, see Section 26 32 13 – Engine Generators.
- B. Charge Air Tubing Flex Connectors: High temperature, double hump, silicone turbo sleeves with rings, 6 inch long, inside diameters as indicated on the Drawings. Flexfab or approved equal. Roll bead in end of Charge Air tubing at Flex to ensure positive connection. Fasten with lined stainless steel T-bolt clamps, Ideal-Tridon 30051 or approved equal.

## **2.9 CRANK VENT HOSE**

- A. Crank Vent Hose: Heavy duty oil resistant PVC suction hose. Tigerflex ORV or approved equal. See design drawings for size.
- B. Install on barbed hose (king) nipples. Fasten with lined stainless steel constant torque clamps, Ideal-Tridon 47 or approved equal.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

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

## **3.2 PREPARATION**

- A. Remove scale and dirt, on inside and outside, before assembly.

### **3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Install pipe hangers and supports in accordance with Drawings and specifications. Refer to Section 23 05 29.
- B. Support muffler and crank vent condensate trap from structure as indicated on the Drawings.

### **3.4 INSTALLATION - PIPING**

- A. Route piping in orderly manner and maintain gradient. Provide weep holes and open ends for condensate drainage as indicated.
- B. Install piping to conserve building space and not interfere with use of space.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- E. Piping and Tubing Insulation: Insulate interior exhaust piping and charge air tubing as indicated on the Drawings in accordance with Section 23 07 19.

### **3.5 CHARGE AIR TUBING TESTING AND REPORTING**

- A. Division 1 – Quality Control
- B. Isolate engines and coolers prior to pressure testing.
- C. Test all Charge Air Tubing with minimum 50 psig air. Test 100% of welds visually for leaks with each joint soaked in a foaming soapy water solution, and visually inspect each joint for leaks. Isolate and pressure test each run of piping for a minimum of one hour. Provide blind flanges, threaded caps, or plugs as needed. Do not conceal pipe joints before pressure testing is complete.
- D. Notify the Authority in writing seven (7) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Pressure testing performed without the Authority present may be rejected unless prior written approval is received from the Authority.
- E. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- F. Submit certified test results to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

**END OF SECTION**

## **SECTION 26 05 00**

### **COMMON WORK RESULTS FOR ELECTRICAL**

#### **PART 1 – GENERAL**

##### **1.1 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.
- F. See Division 1 of which contain information and requirements that apply to work specified herein.
- G. The Contractor shall 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 calibrate devices supplied as an integral part of equipment provided by others.

##### **1.2 RELATED REQUIREMENTS**

- A. This section applies to all Division 26 work.
- B. See Divisions 1, 21, 23, and 33 which contain information and requirements that apply to work specified herein.

### **1.3 TELEPHONE SERVICE**

- A. Telephone service is included in this project as indicated on the Drawings.

### **1.4 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 editions of the following specifically noted requirements:

1. NFPA 70, National Electric Code - NEC;
2. ANSI-C2, National Electrical Safety Code - NESC;
3. International Building Code - IBC; and
4. International Fire Code - IFC.

- 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, and
9. Underwriters Laboratory - UL

### **1.5 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. The word "Contractor" as used in Division 26 specifications shall mean "Electrical Contractor."
- C. The word "General Contractor" as used in Division 26 specifications shall mean the Contractor responsible for the project.
- D. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere as noted or agreed to be installed by supporting crafts.
- E. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
- F. "Provide" means furnish all products, labor, sub-contracts, and appurtenances required and install to a complete and properly operating, finished condition.
- G. "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.
- H. "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.
- I. "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.
- J. "Product" is a generic term which includes materials, equipment, fixtures, and any physical item used on the project.

## **1.6 DRAWINGS, SPECIFICATIONS & SYMBOLS**

- A. The Drawings and Specifications are complementary; what is shown on one is as binding as if called for in both. Do not scale the Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
- B. The Drawings are partly diagrammatic and do not show precise routing of conduits or exact location of all products, and may not show in minute detail all features of the installation; however, provide all systems complete and in proper operating order.
- C. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry and should be universally understood. Special items are

identified by a supplementary list of graphical illustrations, or called for on the Drawings or in the specifications.

## 1.7 SUBMITTALS

- A. Provide submittals for all products and systems described in Division 26 specifications and shown on the Drawings to demonstrate compliance with the requirements of the project. Provide submittals in the manner described herein and in Division 1 with an index following specification format and with item by item identification.
- B. Under this specification section provide submittals for all products and systems listed below. Identify by the schedule reference or drawing.
  - 1. All materials in the Electrical Equipment Schedule on the Drawings.
  - 2. All materials in the Electrical Conductor Schedule on the Drawings.
  - 3. All panels shown on the Drawings that are not referenced under another specification section.
- C. Provide submittals for all materials in the Division 26 specification sections which follow and submit under that specification section.
- D. Submittals shall demonstrate compliance with the requirements of the project. Furnish all relevant data as appropriate including but not limited to:
  - 1. Manufacturer's name and address, and supplier's name, address, and phone number.
  - 2. Catalog designation or model number with rough-in data and dimensions.
  - 3. Operation characteristics.
  - 4. 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.
  - 5. Wiring diagrams for the specific system.
  - 6. Coordination data to check protective devices.
  - 7. Shop Drawings.
- E. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical

design of manufactured equipment. 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.

## 1.8 TESTS

- A. Division 1 - Closeout Requirements.
- B. In addition to field testing, the Contractor shall perform all shop tests for fabricated items as required by the Division 26 specification sections which follow.
- C. The Contractor shall be responsible for field testing all station service and other electrical systems and equipment shown on the drawings. Testing of the generators and switchgear will be performed by the Authority after substantial completion.
- D. The Contractor shall prepare and submit a test plan for review and approval by the Authority.
  - 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 Authority,
    - 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.
    - c. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.
      - 1) Megger bus work, switches, breakers and circuits phase-to-phase and phase-to-ground disconnecting and reconnecting equipment which cannot be meggered otherwise.

- 2) 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 station service 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. Check fuses with an ohmmeter; ring out wiring and busing; check operation of control and safety interlocks.
  7. 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.
  8. 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.
  9. 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).
  10. Overload heaters shall be checked and the size on each phase shall be noted at this time on the test sheet.
- E. Report all test results in writing. Where tests disclose problem areas, retest after the defect has been corrected.
- F. Demonstrate 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.
- G. Operate the electrical systems until acceptance of the work. Instruct operators in the correct operation of all electrical and control systems under your jurisdiction.

- H. 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.
- I. 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.

## **1.9 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 Drawings and/or Specifications are at variance with such codes and regulations, he shall promptly notify the Authority in writing.
  - 2. Should the Contractor perform any work in non-compliance with the above-mentioned codes and regulations without such notice to the Authority, 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 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.
- F. The Contractor shall pay all costs and fees required by inspecting and other agencies required for his work.
- G. Cooperate with the Authority 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 Authority, will be necessary to determine the completeness, quality, or adequacy of the work.

### **1.10 COORDINATION**

- A. Electrical 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 Authority in writing before proceeding with the installation.

### **1.11 LOCATIONS**

- A. If hazardous location boundaries exist, they will be shown on the drawings. Locations for seal-off fittings shall be field determined by the Contractor.
- B. 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.

### **1.12 RECORD DRAWINGS**

- A. Division 1 – Project Record Documents.
- B. Reference requirements stated elsewhere in these specifications.
- C. In addition to other requirements, mark up a clean set of Drawings as the work progresses, to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing or work in permanently concealed blind spaces within the facility. Show complete routing and sizing of any significant revisions to the systems shown.

- D. 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 Authority at all times.
- E. Prepare wiring diagrams on reproducible media using AutoCAD V.2012 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 drawings and their electronic files in full size PDF format to the Authority and obtain a written receipt.

### **1.13 OPERATING INSTRUCTIONS**

- A. Prior to final acceptance, instruct operators on the proper operation and maintenance of all electrical systems and equipment under this contract.
- B. Provide services of qualified technicians familiar with each item or system to instruct operators in operation and maintenance of item or system.
- C. Have approved operating and maintenance data, and parts lists for all equipment on hand at the time of instruction.

### **1.14 OPERATION AND MAINTENANCE MANUALS**

- A. Provide Operation and Maintenance Manuals for the switchgear and for the engine generators as described elsewhere in these specifications. Submit in accordance with Division 1.

### **1.15 PROJECT COMPLETION AND DEMONSTRATION**

- A. Division 1 - Closeout Requirements.
- B. Tests: During Substantial Completion inspection, conduct operating tests for approval.
- C. 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.
- D. 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.
- E. 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.

**1.16 WARRANTY**

- A. Division 1 - Closeout Requirements: Warranties.
- B. 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 Authority such failure is due to neglect or carelessness by the Authority.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 26 05 02**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 – GENERAL**

**1.1 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.

**1.2 RELATED REQUIREMENTS**

- A. This section applies to all Division 26 work.
- B. See Divisions 1, 21, 23, and 33 which contain information and requirements that apply to work specified herein.

**1.3 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 Drawings. Verify locations for junction boxes, disconnect switches, stub-ups, etc., for connection to equipment furnished by others, or in other Divisions of this Work.

**1.4 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.

**1.5 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 the Authority, 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 – PRODUCTS**

**2.1 PRODUCTS FURNISHED IN DIVISION 26**

- 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.

## **2.2 PRODUCTS 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 26 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 power connections to equipment including but not limited to feeders, connections, disconnects and motor running overcurrent protection. Where starters are provided as part of a packaged product, overcurrent heaters shall be provided.

## **2.3 IDENTIFICATION**

- A. Equipment Nameplates:
  - 1. Provide rigid engraved nameplates of laminated plastic 1/16-inch thick with white letters on a black or gray background. Nameplates for emergency equipment shall be red with white letters.
    - a. Securely attach nameplates with two screws, minimum.
    - b. Temporary markings not permitted on equipment. Repaint trims housings, etc., where markings cannot be readily removed. Refinish defaced surfaces.
    - c. No labeling abbreviations will be permitted without prior approval.
  - 2. 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 Drawings, 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.
  - 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. Conduits: Using a label maker, mark all conduits entering or leaving panels with the circuit numbers of the circuits contained inside.
  - D. Junction Boxes: Using a label maker, mark the circuit numbers of wiring on all junction boxes with steel covers.
  - E. Conductors:
    1. Conductors shall be color coded as indicated on the Electrical Conductor Schedule on the Drawings.
    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 be 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**

### **3.1 STORAGE AND HANDLING**

- A. Division 1 – Material and Equipment.
- B. All items shall be delivered and stored in original containers, which shall indicate manufacturer's name, the brand, and the identifying number.
- C. Items subject to moisture and/or thermal damage shall be stored in a dry, heated place.
- D. All items shall be covered and protected against dirt, water, chemical and/or mechanical damage.

### **3.2 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.

### **3.3 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. Provide working space in accordance with NEC 110.26 to permit ready and safe operation and maintenance of equipment.
- 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.

### **3.4 SUPPORT SYSTEMS**

- A. All interior materials used shall be galvanized or zinc plated.
- B. All exterior materials used shall be hot dip galvanized. Where support elements are field cut, exposed metal shall be coated with spray-on cold galvanizing.
- C. Support from structure or as specifically detailed on the Drawings.
- D. Conduits shown to be run at grade shall be supported by 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.

### **3.5 MOUNTING HEIGHTS**

- A. Mounting heights shall be above finished floor (AFF) or above finished grade as noted below, unless otherwise shown or indicated.
  - 1. Lighting Switches, 48 inches to center
  - 2. Receptacles shall be mounted as indicated on the Drawings.
- B. Other mounting heights are indicated on the Drawings by detail.

### **3.6 CUTTING AND PATCHING**

- A. Where previously completed building surfaces or other features must be cut, penetrated, or otherwise altered, such work shall be carefully laid out and patched to the original condition. Perform work only with craftsmen skilled in their respective trades.
- B. Do not cut, drill, or notch structural members unless specifically approved by the Authority. Minimize penetrations and disruption of building features

**3.7 FLASHING AND SEALING**

- A. Seal all interior and exterior wall penetrations with polyurethane caulking. Seal both sides of walls where accessible.

**3.8 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.

**3.9 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.

**END OF SECTION**

## **SECTION 26 05 26**

### **GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

#### **PART 1 – GENERAL**

##### **1.1 SCOPE OF WORK**

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

##### **1.2 RELATED REQUIREMENTS**

- A. Section 26 05 00 Common Work Results for Electrical
- B. Section 26 05 02 Basic Materials and Methods

##### **1.3 MINIMUM REQUIREMENTS**

- A. The minimum requirement for the system shall conform to Article 250 of the NEC.

##### **1.4 SUBMITTALS**

- A. Product Data: Provide in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.

#### **PART 2 – PRODUCTS**

##### **2.1 GENERAL**

- A. Install types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications shall govern.
- B. Material: Copper only. Aluminum is not acceptable for use in any location.

##### **2.2 GROUNDING ELECTRODES**

- A. Copper clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core. Size as indicated on the Drawings.

##### **2.3 WIRE AND CABLE CONDUCTORS**

- A. Ground Grid or Grounding Electrode Conductors shall be bare copper conductors conforming to the following:
  - 1. Solid Conductors: ASTM B-3.
  - 2. Stranded Conductors: ASTM B-8.
  - 3. Tinned Conductors: ASTM B-33.
- B. Station Service Circuit Grounding Conductor: General use conductors in accordance with the conductor schedule, green insulated. Minimum No. 12 AWG.

- C. Generator and Feeder Circuit Grounding Conductor: Extra flexible conductors in accordance with the conductor schedule, size as indicated.

## **2.4 MISCELLANEOUS CONDUCTORS**

- A. Ground Bus: Bare annealed copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05-inch-thick and 2 inches wide, except as indicated

## **2.5 GROUND CONNECTIONS**

- A. All underground ground connections shall be made with exothermic welds.
- B. Wherever the ground rod crosses the ground grid it shall be connected.
- C. Grounding conductor connections to building structure and to equipment skids shall be made with mechanical lugs or compression lugs as indicated. Drill and tap steel structure and equipment as required and fasten with stainless steel bolts for positive bond.

# **PART 3 – EXECUTION**

## **3.1 SERVICE AND STRUCTURE GROUND**

- A. Create a Grounding Electrode System (GES) for this project by connecting the following:
  - 1. Generators, switchgear, and transformers grounded as shown on the Drawings.
  - 2. The neutral conductors grounded only where specifically indicated on the Drawings.
  - 3. Building structure and equipment skids.
  - 4. Other items or equipment as indicated on the Drawings.
- B. Current carrying capacity of the grounding and bonding conductors shall be in conformity with Tables 250.66 and 250.122 of the NEC.

## **3.2 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 Drawings, an additional grounding conductor shall be sized in conformity with Table 250.122 of the NEC.
- B. Provide a separate copper equipment grounding conductor for each feeder and for each branch circuit indicated. Install the grounding conductor in the same raceway with the related phase and neutral conductors, and connect the grounding conductor to pull boxes or outlet boxes at intervals of 100 feet or less. Where paralleled conductors in separate raceways occur, provide a grounding conductor

in each raceway. Connect all grounding conductors to bare grounding bars in panel boards, and to ground buses in service equipment to the end that there will be an uninterrupted grounding circuit from the point of a ground fault back to the point of connection of the equipment ground and system neutral. All grounding conductors shall be sized in conformity with Table 250.122 of the NEC.

- C. Provide separate grounding conductor securely bonded and effectively grounded to both ends of all non-metallic raceways and all flexible conduit.
- D. If non-metallic enclosures are provided, all metal conduits terminating or entering the enclosure shall be bonded together with approved bonding bushings and minimum #6 AWG copper cable.

**END OF SECTION**

## **SECTION 26 05 29**

### **HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

#### **PART 1 – GENERAL**

##### **1.1 SCOPE OF WORK**

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

##### **1.2 RELATED REQUIREMENTS**

- A. Section 26 05 00 Common Work Results for Electrical
- B. Section 26 05 02 Basic Materials and Methods
- C. Section 26 05 33 Raceway and Boxes for Electrical Systems

##### **1.3 SUBMITTALS**

- A. Shop Drawings and Product Data: Provide in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.

#### **PART 2 – PRODUCTS**

##### **2.1 HANGERS AND SUPPORTS**

- A. Support equipment and raceways on strut, brackets, trapeze hangers, or as detailed. Anvil, B-Line, Grinnell, Unistrut, or approved equal.

##### **2.2 FORMED STEEL CHANNEL**

- A. Strut: Cold formed mild steel channel strut, pre-galvanized finish and slotted back unless specifically indicated otherwise.
- B. Standard Strut: 12 gauge thick steel, 1-5/8" x 1-5/8", B-line B22-SH-Galv or approved equal.
- C. Double Strut: 12 gauge thick steel, 1-5/8" x 3-1/4", B-line B22A-SH-Galv or approved equal.
- D. Shallow Strut: 14 gauge thick steel, 1-5/8" x 13/16", B-line B54-SH-Galv or approved equal.
- E. On all exterior installations provide hot dip galvanized strut and fittings.

##### **2.3 FITTINGS AND ACCESSORIES**

- A. Hanger Rods: Continuous threaded rod. Zinc plated carbon steel except for exterior installations provide hot dip galvanized.
- B. Provide fittings, brackets, channel nuts, and accessories designed specifically for use with specified channel strut. Zinc plated carbon steel except for exterior installations provide hot dip galvanized.

- C. Pipe Clamps: Two piece pipe clamp designed to support pipe tight to strut, B-line B20##, or approved equal. Zinc plated carbon steel except for exterior installations provide hot dip galvanized
- D. Fasteners: All bolts, nuts, and washers to be zinc plated carbon steel except on exterior installations provide hot dip galvanized or stainless steel.

## **2.4 EARTHQUAKE ANCHORAGE**

- A. Anchor equipment weighing more than 100 pounds to the building structure to resist lateral earthquake forces.
- B. 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.
- C. 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**

### **3.1 INSTALLATION**

- A. Conduits and equipment shall be mounted using strut or similar supports unless otherwise noted.
- B. Do not strap conduits to piping. When run in parallel with piping maintain adequate separation to allow maintenance to take place on either piping or conduit system so that the other does not have to be removed when maintenance is required.
- C. Conduits shown to be run at grade shall be supported by 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 26 05 33**  
**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 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 Plans, required by Code and specified in these specifications.

**1.2 RELATED REQUIREMENTS**

- A. Section 21 13 29 Fire Suppression
- B. Section 26 05 00 Common Work Results for Electrical
- C. Section 26 05 02 Basic Materials and Methods
- D. Section 26 05 26 Grounding and Bonding for Electrical Systems

**1.3 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.

**1.4 SUBMITTALS**

- A. Shop Drawings and Product Data: Provide in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.

**PART 2 – PRODUCTS**

**2.1 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.

**2.2 ELECTRICAL METALLIC TUBING (EMT)**

- A. Steel tubing, galvanized outside and provided with a slick corrosion resistant interior coating; UL listed and labeled according to Standard 797; conforming to ANSI Standard C80.3.

### **2.3 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.

### **2.4 RIGID PVC CONDUIT**

- A. Rigid nonmetallic conduit shall be NEMA TC2, type EPA-80-PVC high impact, polyvinylchloride (PVC). Fittings used with PVC conduit shall be PVC solvent-weld type. Nonmetallic conduits shall be UL listed for their respective applications.

### **2.5 WIREWAY**

- A. Interior Use: UL listed; NEMA 1, enamel finished; hinged covers except where indicated otherwise. Furnish complete with all fittings, couplings, and accessories; Hoffman, B-Line, or approved equal.

### **2.6 EXPLOSION PROOF COUPLING**

- A. UL listed; Exterior rated, Class 1 Division 1 rated for exterior locations, Eaton, or approved equal.

### **2.7 FITTINGS**

- A. Conduit bodies shall be factory made with threaded hub connections and weather tight screw type covers. For all exterior locations provide malleable iron conduit bodies with hot dipped galvanized finish.
- B. Fittings utilized with rigid steel shall be galvanized steel. Conduit bushings shall be of the insulated type. Where grounding bushings are required, insulated grounding bushings with pressure type lugs shall be provided. Lock rings shall be of the sealing gland type. Provide conduit bushings on all penetrations without hubs.
- C. Couplings and Terminations for Electrical Metallic Tubing (EMT): Join lengths of EMT with steel compression type couplings and connectors. The connectors shall have insulated throats or a smooth interior so as not to damage the insulation during pulling operations.
- D. 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.
- E. Couplings and Terminations for Rigid Nonmetallic Conduit (PVC): PVC shall be solvent weld by male thread adapter, Schedule 40 or Schedule 80 as required. Other fittings shall be solvent weld connections.

- F. Hazardous Location Fittings shall be ferrous iron alloy and/or ductile iron, sized to permit full conduit fill capacity.

## **2.8 JUNCTION BOXES AND ENCLOSURES**

- A. Metallic device/junction boxes for interior use with Electrical Metallic Tubing (EMT) shall be minimum .0625" thick SAE 1008 pressed steel with galvanized finish, 2-1/8" deep welded or drawn construction with 1/2" and 3/4" knockouts. Provide with 1/2" raised face metal covers.
- B. For interior electrical junction boxes larger than 4" square provide NEMA 1 steel wall mount screw cover enclosures. Minimum 12-gauge steel with color ANSI 61 gray powder coated finish. Hoffman, B-Line, or approved equal. Provide with plated or stainless-steel cover screws.
- C. Weatherproof gang boxes for exterior use and where specifically indicated shall be die cast zinc metal with powder coated finish and threaded hubs. Provide with matching weatherproof gasketed covers and mounting hardware.

## **PART 3 – EXECUTION**

### **3.1 CONDUIT USAGE**

- A. INTERIOR - All interior locations shall be electrical metallic tubing (EMT) except where specifically indicated as wireway or GRC.
- B. FIRE SUPPRESSION - All raceways for fire suppression shall be equivalent to INTERIOR previously specified except that all raceways, junction boxes, pull boxes, and cover plates shall be painted red.
- C. EXTERIOR - All exterior above grade locations shall be galvanized rigid conduit (GRC).
- D. BURIED – All exterior below grade locations shall be liquid tight flexible metal conduit, rigid PVC conduit, or galvanized rigid conduit (GRC) as specifically indicated on the Drawings.
- E. Liquidtight flexible metal conduit shall be used in lengths 18 to 24 inches for connections to motors or equipment subject to vibration and where indicated on the Drawings. Longer lengths may be used for equipment connection if grounding conductor is installed through conduit.
- F. HAZARDOUS LOCATIONS – Provide galvanized rigid conduit (GRC) , Explosion Proof Couplings in Class 1 Division 1 locations. Liquid Tight flexible metal conduit suitable for exterior installation may be used in Class 1 Division 2 locations.

### **3.2 CONDUIT INSTALLATION, GENERAL**

- A. Conduit field joints shall be cut square and reamed smooth. Threads shall be cleanly cut and joints drawn up tight. Running threads shall not be permitted.

- B. After cutting and threading exterior GRC, threads shall be cleaned and degreased and shall receive two coats of cold galvanizing compound.
- 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. 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.
- F. Provide seal off fittings when crossing hazardous boundaries into non-hazardous locations and at enclosures where required by CODE. Not all locations where these fittings are required are shown.
- 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. Conduit Supports:
  - 1. Support conduits by wall brackets, pipe straps and strut 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.
- J. 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.
- K. All conduits not used by this Contract shall have a pull wire installed and securely tied off at each end for future conductor installation.

**END OF SECTION**

## **SECTION 26 05 53**

### **IDENTIFICATION FOR FUEL OIL AND GASOLINE ELECTRICAL SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE**

- A. This section applies to the Bulk Fuel and Dispensing systems project only.
- B. Where these specifications conflict with other sections, this specification shall prevail where applicable.

##### **1.2 RELATED DOCUMENTS**

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

##### **1.3 SUBMITTALS**

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

#### **PART 2 - PRODUCTS**

##### **2.1 RACEWAY IDENTIFICATION MATERIALS**

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

## **2.2 CONDUCTOR AND COMMUNICATION AND CONTROL-CABLE IDENTIFICATION MATERIALS**

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

## **2.3 WARNING LABELS AND SIGNS**

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

## **2.4 EQUIPMENT NAMEPLATES**

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

## **2.5 PANELBOARDS**

- A. Provide nameplate on the front of the panel room which identifies the panel. (Example: Panel A.) Provide a nameplate concealed behind the door which identifies the panel, and the source panel. (Example: Panel A, Fed from Distribution Panel 1-Bkr. No. 2)
- B. T1/Fed from Distribution Panel 1, Bkr. No. 1/Serves Panel A)

## **2.6 DISCONNECT SWITCHES AND MOTOR STARTERS**

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

## **2.7 JUNCTION AND PULL BOX IDENTIFICATION**

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

## **2.8 ARC FLASH HAZARD LABELS**

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

## **2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
- B. Minimum Width: 3/16 inch.
- C. Tensile Strength: 50 lb., minimum.
- D. Temperature Range: Minus -40 to plus +185 degrees Fahrenheit.
- E. Color: Black, except where used for color-coding.
- F. Fasteners for Labels and Signs: Stainless-steel machine screws with nuts and flat and lock washers.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. Power-Circuit Conductor Identification: For conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- B. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.
- C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
- E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- F. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- G. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
- J. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
- K. Power transfer switches.

- L. Controls with external control power connections.
- M. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

### **3.2 Labeling Instructions:**

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

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

### 3.3 INSTALLATION

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

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

**END OF SECTION**

## **SECTION 26 09 20**

### **FUEL OIL AND GASOLINE DISPENSING CONTROL PANEL**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE**

- A. Contractor shall furnish industrial control panels as required for use with a fuel oil and gasoline tank farm and dispenser.

##### **1.2 DESCRIPTION**

- A. The control panel controls all motor-driven and other electrically operated equipment comprising the fuel oil and gasoline control system. The various components are fully interlocked for fail-safe operation as shown on the drawings. The operation of all driven components can be manually overridden for equipment startup or troubleshooting. The status of all components and alarms is indicated via illuminated devices located at the control panel enclosure.

##### **1.3 SUBMITTALS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Provide in addition:
  - 1. Identifying Listing / Labeling Third Party Laboratory on plans.
  - 2. Complete schematic drawings with OEM developed wire numbering system and terminal. Submit the following information and shop drawings for approval prior to panel fabrication:
    - a. Ladder diagram showing control logic.
    - b. Scaled, panel layout drawing showing terminal blocks, relays, switches, lamps, and etc.
    - c. Material list, of all components.
    - d. Labeling information showing compliance with UL 508A.
    - e. Spare parts list (fuses, lamps, relays).
    - f. Shop acceptance test procedure.

- g. Complete Bill of Materials on plans.

#### 1.4 SUMMARY

- A. Provide control panels as shown on drawings. General arrangement and control characteristics are shown, contractor is responsible for panel design. Panels are to be discrete relay logic, programmable controllers are not acceptable.
- B. Panels shall be assembled and listed per UL 508a standard for safety for industrial control panels, and the NEC.
- C. Submit the following information and shop drawings for approval prior to panel fabrication:
  - 1. Ladder diagram showing control logic.
  - 2. Scaled, panel layout drawing showing terminal blocks, relays, switches, lamps, and etc.
  - 3. Material list, of all components.
  - 4. Labeling information showing compliance with UL 508A.
  - 5. Spare parts list (fuses, lamps, relays).
  - 6. Shop acceptance test procedure.
- D. Exterior mounted panels shall be NEMA 4X dead front construction with clear access windows displaying status and alarms as shown, interior mounted panels shall be NEMA 12 construction. Properly seal any un-used openings. Panel fronts may not have any plugged or un-plugged openings.
- E. Exterior panels shall include a lockable hinged cover, with no controls. All controls shall be mounted on a hinged “dead front” panel within the enclosure. Terminal strips, relays, and all wiring shall be mounted behind the hinged “dead front” cover.
- F. Interior panels may have the controls mounted on the hinged cover. All terminal strips, relays, and all wiring shall be mounted within the panel.

- G. Provide over current protection on power circuits as they enter the control panel. Size over current protection devices per the NEC.
- H. All panels shall include a removable backplane for mounting equipment.
- I. Panel control equipment (switches, pushbuttons, indicator lamps) shall be 30.5mm size, Allen Bradley bulletin 800t/800h or equal.
- J. All wiring shall be terminated on terminal strips or device screw connections. Terminal strips shall be Allen Bradley bulletin 1492, NEMA terminal blocks or terminal block relays, or equal. Size terminal blocks per manufacturers recommendations. Provide 25% spare terminals. Terminals shall be labeled, and shall correspond to identification labels on shop drawings.
- K. All relays, power supplies, fuse holders and circuit breakers shall be din rail mounted.
- L. Use heat-shrink wire markers to label all wiring within the panel. Wiring shall correspond to ladder diagram terminal block designators where shown. Where not shown panel vendor shall provide terminal assignments and update plans to reflect assignments.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT DESIGN REQUIREMENTS**

- A. Control panel shall be designed and built to UL508 Industrial Control Panel requirements.
- B. Control panel shall be manufactured in a listed Industrial Control Panel Manufacturing Facility.
- C. Control panel enclosure shall be Hoffman or equal, as required for the application.
- D. Control Panel enclosure rating
  - 1. Interior NEMA 12
  - 2. Exterior NEMA4X
    - a. Non-Metallic, AL, or SS
    - b. Deadfront

- c. Lockable
- E. Control panel assemblies.
1. Control panels shall be factory or shop fabricated units completely assembled, wired and tested in the presence of an owner representative before shipment to the job site.
  2. Panel construction shall, in general, meet JIC EMP-1-1967 standards and applicable NEMA and IEEE standards. The panels shall be constructed in accordance with the standards of and bear the label of an accredited nationally recognized testing laboratory.
  3. Control Panels located outside shall be provided with environmental controls to maintain minimum operating temperatures for all internal components. Insulation and / or heaters sized for the minimum temperature shall be provided.
  4. All operable selectors and pushbuttons, including motor overload reset, shall be accessible at the panel door exterior.
  5. Components mounted in the interior shall be fastened to an interior back panel using machine screws plus adhesive to insure vibration-free attachment.
  6. Wiring duct shall be provided for wiring within the panel enclosure including all field wiring. 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.
  7. Line voltage (120 volt or higher) wiring in panels shall be class C stranded copper conductor #16AWG minimum , with type MTW or SIS insulation.
  8. Control conductors to be industry standard (NFPA 79) or Listing Agency requirements.
  9. White with blue stripe: grounded (current-carrying) dc circuit conductors.
  10. Wiring which is an internal part of a device and is not connected to external terminal blocks may be wired using the manufacturer's standard wire designations. 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. 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.
  11. Terminal blocks shall be provided for the termination of power and control wiring. Where multiple terminal blocks are shown for a given wire number or common circuit, additional blocks shall be provided and jumpered as necessary to provide terminal spaces for each individual outgoing wire.

12. Terminal strips shall be mounted on a flat steel channel or strut which raises them to the level of the adjacent wire gutters (2 inch to 3 inch above back panel). Terminal strips shall be mounted at least 6 inches from panel inner walls. Terminal strips shall be labeled by machine print – hand lettered terminal numbered are not permitted.
  13. Provide space for a minimum of 25 percent additional control wiring terminal blocks on each side.
  14. 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. These nameplates shall be sized to the scale of the device to which they refer. The engraving shall be as shown on the panel layout drawing.
  15. The assembled panel shall be meggered and tested to be free from grounds and shorts. All controllers, circuits and interlocks shall be rung out and tested to assure that they function correctly before the panel is shipped. Revise all drawings upon completion of the work to show "as shipped" condition of the panel.
  16. After completion of shop assembly and testing, panels shall be enclosed in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from dust and moisture. Dehumidifiers shall be placed inside the polyethylene covering. The equipment shall then be skid-mounted or crated for final transport. Shipping weight shall be shown on shipping tags, together with instructions for unloading, transporting, storing, and handling on job site.
- F. Control panel components shall be industrial quality. Component schedules shown on the plans provide Manufacturer and part number references.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Testing: Factory tests simulating operation of all of the features described in the narrative shall be performed in the presence of the Owners representative. If the panel test is to take place beyond 50 miles from Anchorage, Alaska, all expenses, including airfare and lodging for one person shall be paid for by the vendor.
- B. Control panel shall be installed in accordance with manufacturer's recommendations, including but not limited to the following:
  1. The control panel shall be installed by a licensed electrician. The National Electrical Code and all applicable state and local codes shall be followed when installing this equipment. The installation shall be executed in a neat and workmanlike manner.

2. At no time shall any individual tamper with or change any of the wiring in the control panel without the knowledge and consent of the manufacturer. The installer shall only land wires on the field terminals provided and install or remove any jumpers as shown and indicated on the control schematics to achieve proper operation. Any changes made to the panel wiring other than those just mentioned or those approved by Owner, in writing, will result in the voiding of any warranty associated with the control panel or any of the connected equipment.

### **3.2 COMMISSIONING**

- A. Commissioning shall be in accordance with Division 26 requirements.

**END OF SECTION**

PART 1 - GENERAL.....	1
1.1 SCOPE .....	1
1.2 RELATED REQUIREMENTS.....	2
1.3 SUBMITTALS.....	2
1.4 QUALITY ASSURANCE .....	3
1.5 FABRICATOR QUALIFICATIONS .....	4
1.6 FABRICATOR WARRANTIES .....	4
1.7 OPERATION AND MAINTENANCE MANUALS .....	4
PART 2 - PRODUCTS AND ASSEMBLY .....	6
2.1 GENERAL .....	6
2.2 ACCEPTABLE MANUFACTURERS OF SWITCHGEAR COMPONENTS .....	6
2.3 SWITCHGEAR ENCLOSURE .....	6
2.4 PAINTING.....	8
2.5 CONTROL WIRING.....	8
2.6 BUS BAR.....	9
2.7 GENERATOR AND DISTRIBUTION CIRCUIT BREAKERS .....	9
2.8 SWITCHGEAR DEVICES.....	10
2.9 GENSET CONTROL PACKAGE.....	13
2.10 PROGRAMMABLE LOGIC CONTROLLER .....	13
2.11 OPERATOR INTERFACE UNIT .....	14
2.12 FEEDER PROTECTION RELAY.....	14
2.13 METERING EQUIPMENT .....	15
2.14 DATA STORAGE SERVER.....	15
2.15 LOCAL AND REMOTE ACCESS .....	16
2.16 CONTROL POWER.....	16
2.17 VARIABLE FREQUENCY DRIVES .....	17
2.18 ENGINE/GENERATOR SECTION ASSEMBLY .....	19
2.19 MASTER SECTION ASSEMBLY .....	20
2.20 DISTRIBUTION FEEDER/VFD SECTION ASSEMBLY .....	22

PART 3 - PROGRAMMING, TESTING AND PACKAGING.....	24
3.1 SYSTEM PROGRAMMING AND SOFTWARE INSTALLATION .....	24
3.2 INSPECTION AND WITNESS TESTING.....	24
3.3 FACTORY TESTING.....	25
3.4 FIELD TESTING.....	27
3.5 PACKAGING .....	28
PART 4 - MONITORING, CONTROL, AND SEQUENCE OF OPERATION .....	29
4.1 ENGINE MONITORING .....	29
4.2 AMBIENT AIR TEMPERATURE MONITORING.....	29
4.3 FUEL and oil SYSTEM MONITORING .....	30
4.4 COOLING SYSTEM MONITORING .....	31
4.5 HEAT RECOVERY SYSTEM MONITORING .....	31
4.6 OIU DISPLAY.....	31
4.7 GENERAL CONTROL SPECIFICATIONS.....	34
4.8 GENERATION SEQUENCE OF OPERATION. ....	34
4.9 FEEDER BREAKER SEQUENCE OF OPERATION .....	41
4.10 VFD SEQUENCE OF OPERATION .....	42
4.11 HEAT RECOVERY SEQUENCE OF OPERATION.....	43

## LIST OF ABBREVIATIONS

CAC:	Charger Air Cooler
CPU:	Central Processor Unit
CT:	Current Transformer
ECU:	Engine Control Unit
EULA:	End User License Agreement
FPR:	Feeder Protection Relay
GC:	Genset Controller
GPH:	Gallons per Hour
HMI:	Human Machine Interface
kWh:	kilowatt hour
LAN:	Local Area Network
O&M:	Operations & Maintenance
OIU:	Operator Interface Unit
PLC:	Programmable Logic Controller
PT:	Potential Transformer
PSI:	Pounds per Square Inch
RPM:	Revolutions per Minute
SCADA:	Supervisory Control and Data Acquisition
SMS:	System Mode Switch
UL:	Underwriters Laboratory
VAC:	Volts, AC
VDC:	Volts, DC
VFD:	Variable Frequency Drive

## SECTION 26 23 00

### PRIME POWER LOW-VOLTAGE SWITCHGEAR

#### PART 1- GENERAL

##### 1.1 SCOPE

- A. The Work shall consist of, but not be limited to, designing, fabricating, testing and providing complete and fully functional switchgear to parallel diesel generating units for prime power generation as indicated on the project design drawings and as specified herein.
- B. The specifications and project design drawings are complementary. What is shown on one is binding whether or not it is shown or specified in the other.
- C. Provide a complete and operational system as specified herein. The components identified shall not be construed to be the complete list of components required for the successful operation of the system as specified. Provide all components and design required for the complete and successful operation of the system, conforming to all the requirements specified herein, whether the components are identified or not. Ensure all devices are installed and operate within their intended purposes. Check all catalog numbers indicated and coordinate all devices installed.
- D. The word "Contractor" as used in this section shall mean the Electrical Contractor responsible for field installation, testing, and commissioning of the system. The word "Fabricator" as used in this section shall mean the company responsible for assembly, wiring, and programming of control equipment and systems.
- E. The paralleling switchgear shall be capable of unattended automatic and manual operation as described herein. The switchgear controls shall be a fully coordinated system that provides the functions and features as specified herein.
- F. The automatic control and overall sequencing, starting, and stopping of the generators shall be performed by a Programmable Logic Controller (PLC). Failure of the PLC shall not inhibit manual operation, paralleling, and control of the individual engine generators.
- G. Automatic start/stop and demand control shall be accomplished through the Genset Controllers (GC). Each generator shall have an electrically operated circuit breaker to perform the normal online/offline paralleling functions of the generator which will be controlled by the GC.
- H. The distribution feeder shall have an electrically operated circuit breaker to perform the normal online/offline functions.
- I. Variable frequency drives shall be provided in the switchgear for radiator fan control as indicated.

- J. The switchgear shall be factory tested separately from the engine generators and field tested with the engine generators as specified herein.

## 1.2 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical
- B. Section 26 05 02 – Basic Materials and Methods
- C. Section 26 23 05 – SCADA System for Switchgear Upgrades
- D. Section 26 32 13 – Engine Generators

## 1.3 SUBMITTALS

- A. Provide in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.
- B. Provide a bill of material for all equipment or material provided as part of the switchgear.
- C. Provide manufacturer's catalog literature for all accessories and equipment. Literature shall be limited to only the items furnished and shall not include entire sections of catalogs or data sheets for items not used. Items shall be marked electronically such that it is clear which item is for what purpose.
- D. Provide complete and accurate shop drawings of the equipment as specified herein. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data. Provide all drawing files in Adobe PDF format. Upon request, provide drawing files in AutoCAD 2016 format; include all title blocks, external references, special fonts, and plot configuration files such that when plotted the AutoCAD file appears like the PDF file.
  - 1. All drawings submitted shall be drawn to accurate scale on sheets not less than 11" x 17"; except for actual pattern or template type drawings, the maximum sheet size shall not exceed 24" x 36". The preferable sheet size is 22" x 34". Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block. Do not reproduce contract documents or copy standard printed information as the basis of shop drawings.
  - 2. All drawings shall use standard ANSI symbols.
  - 3. Provide dimensioned drawings showing enclosure construction and arrangement. In addition, show the locations of all major face mounted devices such as meters, GC, OIU, FPR, etc. and all major internal components such as barriers, bus bars, CT, PT, etc.
  - 4. Provide internal wiring and connection diagrams for each section of the switchgear, a one-line diagram, and three-line diagrams. The one-line diagram shall show all breakers, including frame size and trip setting, protective devices, meters, control devices, and size and temperature rating of all power conductors.

5. Provide schematics of all controls. Provide AC three line and DC control schematic diagrams for each generator, feeder, VFD, and master controls. Provide feeder and generator breaker control schematic diagram. Schematics shall be in ladder diagram format and shall show all control devices and external terminal block numbers.
  6. Provide a PLC communication connection diagram showing all buses, devices, and expansion block cables.
  7. Provide a communication network (LAN) diagram showing all switches, meters, GC's, OIU, PLC, Ethernet I/O device level ring, and Serial to Ethernet server devices.
  8. Provide drawings showing terminal block layouts and interconnecting wiring. The drawings shall show the physical layout of the terminal blocks with their appropriate designations and all connections between terminal blocks, auxiliary switch contacts, control devices, instrumentation, protection devices, etc.
  9. Provide drawings of control switches showing all terminals with numbers, including terminals not used. Identify the use of the terminals.
  10. Provide drawings that show annunciator layouts and nameplate engraving.
  11. Provide heater, lighting, and fan control schematic diagrams.
  12. Provide the following PLC information: a complete ladder diagram showing all address numbers, rung reference numbers, and all preset register values. Include detailed narrative describing the purpose of each rung. Provide complete tables or schedules listing all utilized I/O addresses, internal relay addresses, and timer, counter, and register addresses and values. Include the latest revision date.
  13. Clearly identify all shipping splits. Provide wiring harnesses for any control wiring required to connect between shipping splits. Drawings shall clearly indicate the wiring harness and connections. Provide terminal blocks between the shipping splits for ease of wiring in the field.
- E. Provide proposed settings for review for each GC and Feeder Protection Relay as specified in the sections that follow.
- F. Provide example test forms to be used to document factory testing.

#### **1.4 QUALITY ASSURANCE**

- A. Equipment provided under this section shall not have been in service any time prior to delivery, except as required by testing.
- B. Solid-state circuitry shall meet or exceed the Transient Overvoltage Withstand Test per NEMA ICS1-109 and the Surge Withstand Capability Test (SWC) per IEEE Standard 472 (ANSI C37.90A). In addition, where UL or equivalent standards exist for components, devices, and/or assemblies, such standards shall apply.

- C. Perform all work with skilled craftsman specializing in said work. Install all materials in a neat, orderly, and secure fashion as required by the specifications and commonly recognized standards of good workmanship.
- D. The switchgear shall comply with the requirements of the National Electrical Code for Essential Electrical Systems and shall also comply with applicable standards of NEC, ANSI, IEEE and NEMA.
- E. The switchgear shall also be designed, assembled and tested in strict accordance with UL 891 Standard For Switchboards and UL 508A Standard For Industrial Control Panels or equivalent. The entire switchgear assembly including all accessories shall be listed and labeled as an assembly under UL 891 or equivalent independent testing laboratory standard recognized by the State of Alaska. A nameplate indicating the listing shall be permanently affixed to each section of the switchgear.

### **1.5 FABRICATOR QUALIFICATIONS**

- A. The switchgear shall be designed, assembled, and tested by a qualified fabricator (Fabricator) who is regularly engaged in the business of providing generation switchgear. A list of five prior projects that key staff have worked on may be requested by the Authority after the bid opening and prior to award to verify Fabricator qualifications. The list shall include installation date, description of installation, and a reference contact for each installation.
- B. At the time of bid submittal, the Fabricator shall have current authorization from a third-party listing agency to provide listed switchgear as required by the specifications. Evidence of authorization may be requested by the Authority after the bid opening to verify Fabricator qualifications.

### **1.6 FABRICATOR WARRANTIES**

- A. The Fabricator shall warrant the work for a period of not less than one-year. The warranty period shall commence upon acceptance by AEA of field testing with the engine generators and final commissioning of the equipment.
- B. In the event of a failure of equipment or components or a failure of the system to perform all specified functions during the warranty period, the Fabricator shall repair or replace such defective equipment or components and revise programming and settings as required to achieve full system function. The Fabricator shall assist the Authority as directed to determine the cause of failure and pursue manufacturer's warranties to the extent necessary to obtain replacement equipment and provide proof of action taken upon request.
- C. Provide a nametag on each piece of equipment that clearly identifies the party responsible for the warranty. Nametag shall include the name, address, and phone number, and shop order or Fabricator's serial number.

### **1.7 OPERATION AND MAINTENANCE MANUALS**

- A. Provide operation and maintenance (O&M) manuals for all equipment provided under this contract.

- B. The O&M manuals shall be in addition to any instructions or parts list packed with or attached to the equipment when delivered, or any information submitted for review.
- C. The O&M manuals shall include at a minimum the following information:
  - 1. Sequence of operation of the switchgear system.
  - 2. A complete tag list of all input/output devices including, but not limited to, the PLC, GC, and all monitored and controlled devices.
  - 3. Bill of material for all equipment or material provided as part of the switchgear as previously indicated under Submittals.
  - 4. Manufacturer's catalog literature for all accessories and equipment as previously indicated under Submittals.
  - 5. Complete shop drawings as previously indicated under Submittals, revised to reflect as-built conditions of final construction.
  - 6. Complete test reports documenting all factory tests performed in accordance with requirements of PART 3.
- D. The O&M manuals shall consist of a single Adobe Acrobat PDF file and shall be complete with all revisions and as-built data to reflect the actual equipment and material installed. The O&M manual shall be organized as follows:
  - 1. Provide chapters to separate the different components into logical groupings, i.e. sequence of operation, warranty, bill of material, breakers, enclosures, battery system, meters, etc. At the beginning of each chapter, provide a page with the chapter number.
  - 2. Provide subchapters for each individual switchgear item. Bookmark each chapter and subchapter such that each component can be navigated to directly from the bookmark.
  - 3. Near the front of the PDF file, provide the Bill of Material organized so that each item is identified with the chapter or subchapter where the documentation is located.
  - 4. At the end of the PDF file, provide all drawings, inserted horizontally. Provide a chapter for the drawings and individually bookmark each drawing.
- E. Email download link for the final O&M file to the Authority and provide a copy to the Authority on a USB thumb drive.

## **PART 2 - PRODUCTS AND ASSEMBLY**

### **2.1 GENERAL**

- A. All equipment and material furnished shall be new. Equipment furnished and installed under this section shall be fabricated and assembled in full conformity with the project design drawings, specifications, engineering data, instructions, and applicable standards.

### **2.2 ACCEPTABLE MANUFACTURERS OF SWITCHGEAR COMPONENTS**

- A. Specific parts manufacturer and model have been specified in the following paragraphs not only to meet performance function but also to coordinate and interface with other devices and systems. Approved equal substitutions will be allowed only by Authority's approval. To obtain approval, submittals shall clearly demonstrate how substitute item meets or exceeds specified item quality and performance characteristics and also complies with electrical connections and physical layout requirements.
- B. The following products are specified by brand and part number to maintain commonality for programming and service with similar switchgear used in other rural Alaskan communities. Substitutes will not be allowed for the following components:
  - 1. Programmable Logic Controller (PLC): Allen-Bradley.
  - 2. Genset Controller (GC): Woodward or ComAp.
  - 3. Metering Equipment: Shark 250.
  - 4. Feeder Protection Relay (FPR): Schweitzer Engineering Laboratories, Inc.
- C. Acceptable manufacturers of all components not otherwise indicated shall be ABB, Allen-Bradley, Eaton, IDEC, or Square D.

### **2.3 SWITCHGEAR ENCLOSURE**

The following paragraphs describe general fabrication requirements for the switchgear enclosure.

- A. Provide a freestanding enclosure that is factory built, wired, and tested by the switchgear fabricator. Hinged front-opening doors shall provide required access to all components.
- B. The switchgear shall be front access for all control devices. Provide warning labels and source voltage labels.
- C. All switchgear sections shall be dead front type NEMA 1A construction and labeled in accordance with UL-891, or equivalent. The enclosure shall be divided into individual sections and the maximum dimension of each section shall be as indicated on the project design drawings. All sections shall be rear aligned and shall be capable of being rolled, moved or lifted into the installation position and bolted directly to the floor without the addition of floor sills. Each switchgear

section shall be a completely self-supporting structure. Individual sections shall be bolted together to form the required arrangement.

- D. The enclosure frame shall be die formed 12-gauge steel with reinforcing corner gussets internal and external to the structure members. Alternatively, a 2"x 2"x 3/16" steel angle frame may be used. Bolt-on side, top and rear covers shall be steel of minimum gauge required by listing standard.
- E. Provide each section with an individual hinged door with latches and concealed hinge construction. Latches shall be one of the following.
  - 1. One three-point single handle operated latch.
  - 2. Multiple single-point latches consisting of captive knurled handle quarter-turn cam fasteners. Doors which are 36 inches or less in height shall have a minimum of two single-point latches; doors which are greater than 36 inches in height shall have three single-point latches.
- F. Provide each section with back and side pans as required for mounting equipment and wiring. Mounting attachments shall be welded studs or other approved methods. No bolts, screws, or other attachment hardware shall be visible from the exterior.
- G. For each generator section provide separate cubicles for control and power using interior barrier panels to ensure isolation of equipment for safety to personnel during service and maintenance or cable pulling. The upper cubicle shall contain the low voltage (120V max) controls. The lower portion shall contain 480V power equipment and ancillary devices.
- H. Power and control cables shall enter from the top. Provide a cable area behind the controls cubicle of each generator section for routing power cables. Provide isolation barriers between each cable area such that each section is completely isolated from any adjacent section. Provide a removable cover plate on top of the cable area large enough to terminate a 3" rigid conduit with locknuts and conduit bushing. The removable cover plate shall cover the entire cable area.
- I. The switchgear shall have one master section. The master section door shall swing so the door front is visible from the generator sections. See the enclosure layout on the project design drawings.
- J. The switchgear shall have one feeder/VFD section or multiple sections as indicated.
- K. Where the main bus is not isolated by barrier plates, provide a glastic cover for isolation over the entire length of the bus.
- L. Overall nameplate. Provide an overall nameplate that provides the following information:
  - 1. Fabricator's name, address, and phone number.
  - 2. Fabricator's serial number or project identification.
  - 3. Year of manufacture.
  - 4. Third party listing identification.

5. Rated maximum voltage.
6. Rated bus ampacity.
7. Rated bus interrupting capacity.

## **2.4 PAINTING**

- A. Steel and iron surfaces shall be protected by suitable paint or coatings. Surfaces that will be inaccessible after assembly shall be protected for the life of the equipment.
- B. Surfaces shall be cleaned, prepared and coated in the shop. All mill scale, oxides, and other coatings shall be removed. All metal enclosure parts shall be phosphatized to ensure that the metal is properly degreased and cleaned.
- C. Exposed surfaces shall be finished smooth, thoroughly cleaned and filled as necessary to provide a smooth uniform base for painting and painted with one or more coats of primer and two or more finish coats of alkyd resin machinery enamel or lacquer as required to produce a smooth hard durable finish.
- D. Provide a premium painting system throughout the painting process from initial cleaning to final assembly to assure a superior paint finish. All coatings shall be applied using an electrostatic paint system.
- E. The color of the exterior panel finish coats shall be ANSI 61 light gray. The color of the interior back and side pans shall be white.

## **2.5 CONTROL WIRING**

- A. All new control wiring for the switchgear shall be minimum 600-volt, copper 16-gauge, strand type SIS wire or equivalent. The Fabricator shall be responsible for sizing the appropriate wire for each component and circuit. Current transformer wiring shall be 12-gauge wire.
- B. Terminate all wiring on terminal blocks or devices. No more than two wires shall be connected to a termination point. Terminal blocks for control wiring shall be 20 amp, 600 volt. Provide all terminal blocks and exposed relays located in the controls compartment with a plastic safety cover. Terminal blocks for DC circuits shall be separated from terminal blocks for 120VAC.
- C. Only one wire shall be inserted into a lug. Install lugs with a ratcheting type crimping tool. Tag all wires with wire markers at both ends.
- D. Splicing of control or CT wires is not allowed.
- E. All control wiring landing on screw terminals shall have solderless terminals, T&B Sta-Kon or approved equal. Solderless terminals for current transformer leads shall be insulated ring-tongue type, all others shall be insulated fork-tongue type. All lugs and solderless terminals shall be tin-plated copper.
- F. Wire current transformer leads to shorting type terminal blocks. Shorting pins shall be provided with storage locations for the shorting pins.
- G. Provide terminal blocks for control wires that run between the switchgear and external equipment and devices. Clearly label terminal blocks to match the

designation shown on the Fabricator's drawings. Provide a separate terminal strip for interconnection with each generator. The generator terminal strip shall be arranged and numbered exactly as shown on the project design drawings.

- H. Both ends of each wire shall be identified per the marking and numbering shown on the wiring drawings with heat shrink or wrap-around adhesive labels.
- I. Wiring shall be installed neatly in bundles and wireways. Adhesive backed Ty-Rap bases shall not be used to support bundles. All wiring bases shall be securely attached with metal screws.

## **2.6 BUS BAR**

- A. Provide silver-plated copper main bus bars. Size the main bus to meet the ampacity indicated on the project design drawings. If the actual ampacity of the bus installed exceeds the design value, the switchgear bus shall be rated as indicated on the project design drawings.
- B. The main bus shall be well braced to meet the short circuit ratings of the generators. Minimum bus bracing shall be 30,000 amperes symmetrical, unless indicated otherwise on the project design drawings. The main bus shall be installed on insulators to provide proper clearances between phases and phase to ground.
- C. Provide an isolated copper neutral bus rated the same as the main bus. The neutral bus shall have a single removable connection to the ground bus. The connection shall be accessible in the feeder section.
- D. The switchgear shall have a bonded copper ground bus minimum size 2" x 1/4", or as required for the bus ampacity.
- E. Horizontal bus joints between each section shall be silver-plated copper. Bus joints shall be bolted with high tensile steel bolts with spring loaded Belleville type washers.
- F. A-B-C type bus arrangement (left-to-right, top-to-bottom, front-to-back) shall be used throughout to assure convenient and safe testing and maintenance.
- G. Provide termination bars on the load side of the feeder breaker and on the line side of the generator breakers for termination of field wiring. Provide holes in the termination bars for field connection of lugs suitable for termination of #4/0 AWG cables, minimum 2 for each phase. Provide additional holes where specifically indicated.
- H. The feeder, generator, VFD, and station service circuit breakers shall be connected to the main bus by cables. All cables and connections shall be rated for the full ampacity of the circuit breaker frame.

## **2.7 GENERATOR AND DISTRIBUTION CIRCUIT BREAKERS**

- A. Provide each generator and distribution feeder with an electrically operated stationary mount type circuit breaker. Circuit breakers shall be ABB SACE E-Max, Eaton Magnum DS, Square D Masterpact NT, or approved equal.

- B. Circuit breakers shall be designed for continuous operation at 100% of the circuit breaker rating. Circuit breakers shall be suitable for power flow in either direction through the breaker.
- C. Minimum interrupting rating of breakers shall be 50,000 amperes symmetrical.
- D. Provide breaker frame size as indicated on the project design drawings.
- E. A protective trip element is not required, as protection will be provided by the GC for the generator breakers and by the FPR for the distribution feeder breaker.
- F. Provide circuit breakers with the following features:
  - 1. Three-pole stationary mount.
  - 2. Remote open/close.
  - 3. Shunt trip.
  - 4. 24V DC control voltage.
  - 5. 120V AC spring charging motor for automatic recharging of the breaker stored energy mechanism. The stored energy mechanism shall be capable of an open-close-open cycle without recharging.
  - 6. Anti-pumping feature.
  - 7. Manual spring charging mechanism.
  - 8. Mechanical operation counter.
  - 9. Auxiliary switch module.
  - 10. Lockable push button cover

## 2.8 SWITCHGEAR DEVICES

- A. Nameplates. All nameplates shall be black with white core type. Nameplates shall have beveled edges and shall be secured with a minimum of two mounting screws. Provide nameplates for each device on the front of the switchgear and inside the switchgear. Inside the switchgear compartments, all relays, control switches, lights, etc. to which control or instrument transformer wiring connects, shall be marked by nameplates, with designations corresponding to the same device designations used on the wiring drawings and approved by the Authority. Nameplates inside the switchgear located on the front doors may be attached using adhesive epoxy.

Relays shall have the nameplates installed separate from the relay such that the relay can be removed without affecting the nameplate. Route all wiring such that it does not inhibit the visibility of the nameplate or interfere with the removal of the relay.
- B. Selector Switches. Selector switches shall be heavy-duty type. Contacts shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts AC. Contact configuration shall be as required for the application. Legends shall be engraved on the switch nameplate. Unless otherwise specified, all selector

switches located on the front of the enclosure shall be Electroswitch Series 24 or approved equal.

1. System Mode Switch. AUTO/MAN, Two-position lever operated maintained contact. Electroswitch 24201C or approved equal.
  2. Feeder Breaker Control Switch. TRIP/ - /CLOSE Three-position lever operated momentary contact spring return to center, Electroswitch 2438D or approved equal.
- C. Generator Lockout Switch (GLS). Key operated maintained contact OFF/RUN switch. Allen Bradley Series 800, Eaton Series 10250, or approved equal.
- D. Emergency Stop Button. Push/Pull maintained contact with guard, red. Allen Bradley 800FM-F2 or approved equal.
- E. Annunciator Lights. LED cluster type panel mount lamps. IDEC Corp. Series SLC40, or approved equal.
- F. LED panel illumination kit, complete with door switch. Hoffman LED24V15, or approved equal.
- G. Convenience receptacle. 120 volt duplex receptacle, din rail mount, 15 ampere rating, GFI. Phoenix Contact 5600462, or approved equal.
- H. Control Relays/Time Delays. Relays and timers for control operations or isolation shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays and timers shall be UL recognized, have 120-volt AC or 24-volt DC coils, depending on the application. Relays shall not have less than double-pole, double-throw contacts. Control circuit relays shall have silver-cadmium oxide contacts rated for 10 amperes at 120 volts AC. Electronic switching duty relays shall have gold-plated or gold alloy contacts suitable for use with low-level signals. Relays utilized for PLC input, alarm input or indicating light service shall have contacts rated not less than 3 amperes. Provide all relays and timers with indicating lights. IDEC Corp. or approved equal.
1. Relays for use on 24-volt DC circuits shall be provided with different bases than those for use on 120-volt AC circuits to prevent inadvertent swapping of relays.
  2. Auxiliary power relays shall be Allen-Bradley series 700, minimum 20A rated, or approved equal.
  3. Dead bus relay shall be IDEC RR3BUL-AC120V with SR3B-05 base, or approved equal.
- I. Circuit Breakers.
1. Protective devices shall be resettable circuit breakers for all AC and DC circuits in the switchgear. Replaceable fuse type devices are not acceptable.
  2. Circuit breakers shall be molded case type of the amperage, voltage, short circuit capacity, and number of poles required for the application or as indicated on the one-line diagram.

3. Provide manually operated molded case circuit breakers to protect the branch power circuits of the variable frequency drives (VFDs). The breakers shall be sized and connected as indicated on the one-line diagram on the project design drawings, and as specified herein. Provide each breaker with a shunt trip.
  4. Provide manually operated molded case circuit breakers to protect the station service transformer and other branch circuits as indicated on the one-line diagram on the project design drawings. The breakers shall be sized and connected as indicated, and as specified herein. Mount the breakers in the face of the switchgear with a protective guard and provide auxiliary contacts to indicate position. Wire the closed position contact to the PLC to provide alarm indication any time the breaker is not closed (either tripped or manually opened).
- J. Current Transformers. Instrument current transformers shall be specifically designed for installation in switchgear. The design shall coordinate the thermal, mechanical, and insulation limits of the current transformers with those of the breakers and bus of the switchgear. Provide current transformers of the wound or window type, with silver-plated primary terminals. Insulation shall be suitable for 600 volt service.
1. Current transformers for relay service - minimum C20 accuracy class with a rating factor of 2.0.
  2. Current transformers for bus meter - metering class with a minimum 0.3% accuracy and a rating factor of 2.0.
  3. Current transformers for the station service meter - metering class with a minimum 0.3% accuracy.
  4. Multi-ratio Current transformers - provide ratio as indicated with the accuracy specified at full distributed windings.
  5. The CT burden shall be suitable for the devices attached without saturating.
  6. All CT's shall be provided with shorting type terminal blocks complete with shorting pins.
- K. Potential Transformers. Provide instrument rated potential transformers in the quantity and ratio as indicated on the project design drawings. Provide primary and secondary protection using circuit breakers.
- L. Control Power Transformers. Provide control power transformers for circuit breaker trip mechanism charging in the quantity and ratio as indicated on the project design drawings. Provide primary and secondary protection using circuit breakers.
- M. Ambient Air Temperature Sensors. Provide moderate temperature range, 2-wire, platinum RTD, 100 ohms +/- 0.15%, @ 0°C tolerance. Pyrocom RLB73203E10S, or approved equal.

## 2.9 GENSET CONTROL PACKAGE

The basis of design is the Easygen as specified below. The only acceptable substitute is a ComAp IntelliGen 500. If using the ComAp, furnish equivalent modules and accessories as required to provide all features and perform all functions as specified for the Easygen.

- A. Genset Controller (GC). Door mounted style with display face, Woodward Easygen Model 3200XT-P1, Part Number 8440-2082, or ComAp IntelliGen 500.
- B. Easygen digital I/O expansion module, 8 inputs, 8 outputs. DIN rail mounting, 24V DC. Woodward 8440-2028, or ComAp equal.
- C. Signal Converter. Multi-input, 4-20mA Output, 2 programmable relay outputs. Provide for isolation protection of Easygen analog inputs. Automation Direct, SCU-1600, or approved equal.
- D. Additional items, components, or wiring that may be required for a complete and operational system as specified herein.

## 2.10 PROGRAMMABLE LOGIC CONTROLLER

- A. Programmable Logic Controller. Allen-Bradley, CompactLogix 1769, no substitutes. Provide the following:
  - 1. 24VDC power supply. Allen-Bradley 1769-PB4.
  - 2. CPU (2 Mb Memory, Ethernet). Allen-Bradley 1769-L33ER.
  - 3. ModBus TCP/IP Communications Module. Pro-Soft MVI69E-MBTCP.
  - 4. Right End Cap/Terminator. 1769-ECR.
  - 5. Compact Blocks, 24VDC, as required which may include the following:
    - a. Point I/O digital input module 8 point, sinking. Allen-Bradley 1734-IB8.
    - b. Point I/O digital output module 8 point, sourcing. Allen-Bradley 1734-OB8.
    - c. Point I/O analog input module 2 point, 4-20mA. Allen-Bradley 1734-IE2C.
    - d. Point I/O analog output module 2 point, 4-20mA. Allen-Bradley 1734-OE2C.
    - e. PLC to Ring I/O ETAP). Allen-Bradley 1783-ETAP.
    - f. Ethernet network adapter, redundant. 24VDC power. Allen-Bradley 1734-AENTR.
  - 6. Provide additional items as may be indicated on the project design drawings or required for the proper and complete operation of the system as specified.
- B. Provide cables, connectors, and interface devices as required for a complete and operational system.
- C. All I/O devices shall be connected in a single ethernet ring.

## 2.11 OPERATOR INTERFACE UNIT

- A. Operator Interface Unit (OIU). A human machine interface (HMI) referred to herein as OIU shall be installed on the front of the switchgear master section door. The OIU shall be an integrated touch screen display computer with solid state drives, Logic Supply CV-115C-P1001, or approved equal. The OIU shall meet the following minimum requirements:
1. 15” display with minimum of 1024 x 768 pixel resolution.
  2. LCD Color: 16.2M, Pixel Pitch (mm): 0.297 (H) x 0.297 (V).
  3. Projected Capacitive Touch.
  4. Intel Atom Processor E3845 Quad Core. 2 GB SO-DIMM DDR3L 1066/1333MHz memory, 40 GB SATA Solid State Hard Drive, Compact Flash Drive.
  5. 3 USB 2.0 Ports, 1 USB 3.0 port, 10/100M Ethernet Port, serial port.
  6. 24VDC power supply.
  7. Windows 10 Professional, 64 bit.
  8. Passive cooling without fan.

## 2.12 FEEDER PROTECTION RELAY

- A. Feeder protection shall be provided by the Feeder Protection Relay. Feeder protection relay (FPR) shall be Schweitzer Engineering Laboratories, Inc. model SEL-751A, no substitutes. The Fabricator shall determine complete FPR settings for each feeder in accordance with the Feeder Sequence of Operation that follows. Submit proposed settings for review as part of the submittal. Fabricator shall develop the actual configuration part number to provide a relay that meets all requirements as follows.
1. Under/over frequency.
  2. Under/over voltage.
  3. Instantaneous overcurrent (phase/neutral).
  4. Time overcurrent (phase/neutral).
  5. Residual instantaneous overcurrent.
  6. Residual time overcurrent.
  7. Neutral instantaneous overcurrent.
  8. Neutral time overcurrent.
  9. The FPR shall also be provided with the following additional features:
    - a. EIA-232 Rear, Single 10/100BASE-T Ethernet, Modbus TCP, IEC 61850.
    - b. 24V DC power supply and input.
    - c. DI/DO as required to meet the requirements of the specifications.
    - d. Three-phase voltage and current input. Five amp current.

- e. Synchronism check element.
- f. Metering to include the following:
  - Voltage, L-L and L-N.
  - Current; three phase and neutral.
  - Percent voltage imbalance.
  - Apparent power (kVA).
  - Real power (kW).
  - Reactive power (kVAR), positive or negative.
  - Power factor.

### **2.13 METERING EQUIPMENT**

- A. Bus Meter. Class 10 current inputs, 120VAC input, 18-60VDC power supply. Provide with Ethernet communications port, panel mount remote display module, cable, 10MB memory, waveform capture, and optional 4-20mA I/O card. SHARK 250-60-10-V3-D-INP100S-20mAOS, no substitutes.
- B. Station Service Meter. Class 10 current inputs, 120VAC input, 18-60VDC power supply. Provide with Ethernet communications port, panel mount remote display module, cable, 2MB memory. SHARK 250-60-10-V2-D-INP100S-X, no substitutes.
- C. Provide all cables, connectors, and other devices including CT shorting terminal blocks as required for a complete and operational metering system.

### **2.14 DATA STORAGE SERVER**

- A. An industrial fanless mini PC shall be installed in the switchgear master section. The mini PC shall be as follows:
  - 1. Processor: Intel Core i7-8700 up to 4.6GHz
  - 2. Ram: 16 GB, UDIMM DDR4 2666MHz (non-ECC)
  - 3. Hard drive: minimum 512 GB M.2 PCIe Class 40 SSD
  - 4. Auto Power On
  - 5. Dust Filter for Small Form Factor
  - 6. Windows 10 Professional, 64 bit
  - 7. DIN Rail Mounting Kit or Mounting as required
  - 8. OptiPlex XE3 Small Form Factor 300W 120VAC Power Supply
  - 9. DELL OptiPlex XE3 SFF XCTO, or approved equal.
- B. Furnish and install all cables and interface devices required for a complete and operational system plus any additional devices that may be required to be fully functional and meet the requirements of these specifications.

## 2.15 LOCAL AND REMOTE ACCESS

- A. Provide the switchgear with an Ethernet connection for access to the switchgear LAN via internet. See Section 27 05 10 - Communications and Data Service for internet service requirements.
- B. Industrial Ethernet Switch. 16 port, Unmanaged, 10/100 MBPS, 24VDC Ethernet switch, N-Tron 116TX or approved equal. All equipment shall be connected to provide seamless communication between the PLC, LAN devices and the Ethernet connection to the Internet. Provide multiple switches for systems requiring more than 16 ports.
- C. Secure Serial to Ethernet Server. Configured to support RS-232, RS-422, and RS-485 with two pin power terminal connector. NetBurner SB800EX-TDD-IR or approved equal with DIN 200 mounting bracket. Install industrial SD card.
- D. The data storage server shall store historical and real time data from the PLC and Bus and Station Service Meters, and shall provide the primary means for remote access via LogMeIn for data retrieval, remote monitoring, and device programming access.
- E. All devices on the switchgear LAN shall be remotely accessible via the internet for system monitoring, data acquisition, and troubleshooting. Remote access shall allow a technician in another location to modify and/or view all operational screens and all logic in the PLC, as well as the GCs, FPR, VFDs, Serial to Ethernet Server(s), and metering equipment.
- F. Provide communications connections as required for the proper operation and control of the systems.

## 2.16 CONTROL POWER

- A. Control power for the switchgear shall be 24VDC, except where specifically indicated otherwise. All meters and other components requiring auxiliary power to operate shall operate from the 24VDC control power source, unless otherwise specified. All control circuits shall be 24VDC.
- B. Provide a complete 24VDC power supply with redundant secondary backup. Include all items described below plus all other components required for a complete system. The primary source shall be a 120VAC to 24VDC power supply using 120VAC station service power. The secondary source shall be from a 24VDC-24VDC battery buffer module using power from either 24VDC engine batteries as indicated below. The two power supplies shall be coordinated to automatically switch from the 120VAC source to the 24VDC source upon loss of AC power and automatically switch back when the AC power is restored. The system shall provide continuous power without interruption. The 24VDC control power system shall include the following major equipment:
  - 1. Primary Power Supply. 100-240VAC primary input, minimum 20 amp, 24VDC output at 45°C. PULS CP20.241-S1, or approved equal. Install primary power supply in the master section.

2. Battery Buffer Module. 22-29VDC input, minimum 15 amp, 24VDC output. The module shall include capacitors to buffer power during engine crank cycles with a minimum capacity of 15A for 9 seconds. Siemens 6EP1933-2EC51, or approved equal. Install battery buffer module in the master section.
- C. The DC power from the engine batteries shall enter in the respective generator section. A 20A circuit breaker shall be installed on the battery power supply.
- D. The 24VDC outputs from each generator section shall be connected to the 24VDC input on the battery buffer module in the master section through a power bridge rectifier, minimum 35A, rated, Powersem or approved equal. Provide multiple rectifiers as required for the quantity of inputs.
- E. The 24VDC power supply to each switchgear section (master, generator and feeder/VFD) shall be isolated through a 15A circuit breaker in each respective section.
- F. Each major device or meter shall be individually protected by circuit breakers. Clearly mark each circuit breaker for the intended service.
- G. 120V AC Circuit Breaker Charging - Power for the distribution feeder circuit breaker spring charging motor(s) shall be derived from a control power transformer connected to the main bus. Power for the generator circuit breaker spring charging motors shall be derived from a control power transformer connected on the generator side of the circuit breaker.
- H. 120V AC Control and Utility Power – Provide 2 sets of terminals for connection of incoming 120V AC power, 20A, single phase. One shall be for utility power and one for control power as indicated. The 120V AC system shall include:
  1. Utility Power – One circuit shall provide power to all sections of the switchgear for lights and ventilation fans and convenience receptacle as indicated and required for each section.
  2. Control Power - One circuit shall provide power to the UPS and to the 120V AC to 24V DC power supply. No other devices shall be connected to this circuit.
  3. UPS – The UPS shall be a packaged unit for installation on a standard 19” rack. It shall be complete with a sealed leak-proof maintenance free lead acid battery. It shall be 120V, 60Hz input and 120V, 60Hz, 2200VA output. APC SMX 2200RMLV2U, or approved equal.
  4. The UPS shall be installed on the rack in the master section. It shall be connected to provide 120V AC power to the data storage server.

## 2.17 VARIABLE FREQUENCY DRIVES

- A. Provide the following VFD section components:
  1. Main circuit breaker, manually operated molded case circuit breaker, 15A, 3 pole. Allen Bradley 1489-M3D150, or approved equal. Furnish with auxiliary contacts and shunt trip.

2. VFD Selector Switch. Three-position lever operated maintained contact switch to select between VFD/BYPASS/OFF operating modes. The switch shall be rated for occasional switching of motors of the size and voltage indicated, Salzer Part # H216-71322-013V1 or approved equal. Furnish with a minimum of 4 each auxiliary contacts.
3. Variable Frequency Drive: Square D Altivar ATV320U40N4B, or approved equal, complete with the following features and accessories:
  - a. UL listed.
  - b. Sized for continuous operation of 5 hp motor.
  - c. Ramp regulation, flying start, and step logic.
  - d. Built-in PID control using 4-20 mA signal as the control variable.
  - e. Sensorless vector slip compensation.
  - f. Motor protection including overload protection, short circuit protection, ground fault protection, and under & over voltage protection.
  - g. 1:100 speed range.
  - h. RS-485, ModBus protocol.
  - i. 4-20 mA analog input.
  - j. Four assignable logic inputs.
  - k. Two relay logic outputs.
  - l. Remote Graphic Display Terminal. Square D VW3A1101, or approved equal.
  - m. Remote Graphic Display Mounting Kit. Square D VW3A1102, or approved equal.
  - n. Modbus TCP/IP Ethernet communications card. Square D VW3A3616, or approved equal.
  - o. Cables and connectors as required.
4. Contactor for normal run operation. VFD isolation contactor. Allen-Bradley model 100-C23ZJ10, or approved equal. Furnish with one normally open auxiliary contact.
5. Adjustable solid-state overload relay, 480-volt, 3-phase, adjustable range. Allen-Bradley model 193, or approved equal, complete with din rail adapter.
  - a. For motor sizes 2 HP and smaller provide 1.0-5.0A trip range.
  - b. For motor sizes 3 HP and 5 HP provide 3.2-16A trip range.
6. Cooling fan, with filter and grille, sized to keep the VFD operating within its temperature limitations based on a 100° F ambient temperature.

## 2.18 ENGINE/GENERATOR SECTION ASSEMBLY

- A. Provide the following components for each generator section as required to allow automatic or manual operation and control of each generator.
1. Genset Controller (GC). The GC shall communicate to the PLC via Modbus TCP and Point I/O blocks. The top of the GC screen shall not exceed 60" above the bottom of the switchgear.
    - a. Signal Converter. Provide a signal converter on Analog Inputs 1 thru 3, to provide isolation and protection
    - b. Easygen digital I/O expansion module. Provide as needed to meet the functional requirements of the system.
  2. Generator Lockout Switch. Provide a key operated OFF/RUN switch mounted in each generator control section door. All switches for the entire project shall utilize a common key. Provide two keys for each generator section.
  3. Alarm Reset. Provide an Alarm Reset push button that resets all GC alarms after the alarm condition has been corrected.
  4. Service Hours Reset. Provide a Service Hours Reset push button that resets the timer for engine service (oil change) intervals.
  5. Generator Circuit Breaker.
  6. Control power transformer for spring charging motor, size as indicated on the project design drawings.
  7. Potential Transformers, quantity and ratio as indicated on the project design drawings.
  8. Current Transformers for relaying, quantity and size as indicated on project design drawings. Provide with shorting terminal blocks.
  9. 24VDC 15A circuit breaker for control power.
  10. LED panel illumination kit, complete with door switch
  11. Provide Terminal Blocks, Relays, Timers, Bases, as needed.
  12. Generator breaker Status Annunciation LEDs (mount immediately above generator breaker control switch):
    - a. Generator “#” Breaker Closed (red)
    - b. Generator “#” Breaker Open (green).
  13. Provide annunciation LED's, mount near top of cabinet, left to right:

Top Row

    - 1) Engine Running (green).
    - 2) Alarm/Lockout (red).
    - 3) Low Oil Pressure (red).

- 4) Oil Level (red).
- 5) High Coolant Temperature (red).
- 6) Over Speed (red).
- 7) Over Crank (red).
- 8) Running Timeout (red).
- 9) Battery Charger Failure (red).
- 10) Air Filter Plugged (red)
- 11) High Exhaust Temperature (red).
- 12) Spare or High Intake Air Temperature (red), see note 2.

Second Row

- 1) Lead Engine (green). Note that this is only for units with two or more identical size engines. See Note 1.
- 2) Normal Stop (amber).
- 3) Not in Auto (red).
- 4) Generator Breaker Trip (red).
- 5) fail to Synchronize (red).
- 6) Over Current (red).
- 7) Under Voltage (red).
- 8) Over Voltage (red).
- 9) Under Frequency (red).
- 10) Over Frequency (red).
- 11) Reverse Power (red).
- 12) Spare or Charge Air VFD Failure (red), see note 2.

Note 1: For sections that do not require a specific lamp such as Lead Engine provide spare lamp with blank nameplate.

Note 2: Provide High Intake Air Temperature and Charge Air VFD Failure on engines with charge air cooler. Provide Spare on all other engines.

## **2.19 MASTER SECTION ASSEMBLY**

- A. Provide the following components in the master section:
1. PLC.
  2. OIU.
  3. Bus Meter.
  4. Station Service Meter.
  5. Data Storage Server.

6. Control Power Supply, 120VAC / 24VDC.
7. Battery Buffer Module.
8. UPS/Server Rack – One standard 4-post rack, 19” wide for installation of the UPS and the data storage server.
9. Uninterruptable Power System (UPS)
10. Secure Serial to Ethernet Server.
11. Dead bus relay.
12. Industrial Ethernet Switch, minimum quantity two
13. One 15-amp circuit breaker for the switchgear AC power to the lights, fans, and receptacle. Power supply shall be from the station service power. Provide terminals for external power connection.
14. Convenience receptacle, 120 volt duplex GFI receptacle, din rail mount, 15 ampere rating.
15. LED panel illumination kit, complete with door switch
16. System Mode Switch, AUTO / MAN.
17. Emergency Stop Button.
18. A single RESET push button that manually resets all master section alarms.
19. A single LAMP TEST push button that tests all master section and engine generator section annunciation LEDs simultaneously. Note that this includes all master and generator section lamps but does not include VFD lamps.
20. Terminal Blocks, Relays, Timers, Bases, as required.
21. Spare Input: Provide a minimum of 2 spare PLC discreet input pairs wired to terminal blocks.
22. Spare Output: Provide a minimum of 2 spare two-pole relays wired to terminal blocks and controlled by PLC.
23. Master annunciation LED’s, mount near top of cabinet, left to right:  
Top Row
  - 1) Fire Alarm (red).
  - 2) Emergency Stop (red).
  - 3) Low Coolant Level (red).
  - 4) Fuel Level (red).
  - 5) PLC Failure (red).
  - 6) System Not In Auto (amber).
  - 7) Station Service Breaker Open (red).

- 8) VFD Main Breaker Open (red).
- 9) Feeder Breaker Trip (red).
- 10) Feeder Fail To Close (red).

Second Row

- 1) Spare (red).
  - 2) Spare (red).
  - 3) Spare (red).
  - 4) No Load On Heat Recovery (amber).
  - 5) Heat Recovery Loss Of Pressure (amber).
  - 6) Heat Recovery Loss Of Flow (amber).
  - 7) High Coolant Return Temp (red).
  - 8) Spare (red).
  - 9) Spare (red).
  - 10) Spare (red).
- B. Provide two ambient air temperature sensors, one for outside air temperature and one for inside air temperature. Temporarily secure in the master section for shipping. Final field installation shall be outside the switchgear.

**2.20 DISTRIBUTION FEEDER/VFD SECTION ASSEMBLY**

- A. Provide the following feeder components:
1. Feeder Circuit Breaker.
  2. Feeder breaker Status LED indicating lights (mount immediately above feeder breaker control switch):
    - a. Feeder Breaker Open (green).
    - b. Feeder Breaker Closed (red).
  3. Control power transformer for spring charging motor, size as indicated on the project design drawings.
  4. Feeder protection relay (FPR).
  5. Feeder breaker manual control switch, open/close spring return to center.
  6. Current Transformers, quantity and size as indicated on the project design drawings. Provide with shorting terminal blocks.
  7. Potential Transformers, quantity and ratio as indicated on the project design drawings.
  8. 24V DC 15A circuit breaker for control power.
  9. LED panel illumination kit, complete with door switch.

10. Circuit breakers for station service and VFD branch circuits, manually operated, with auxiliary contact, sized as indicated on the project design drawings.
- B. Provide the following VFD components. Locate the variable frequency drives (VFD) above the feeder breaker section as indicated on the project design drawings.
1. Circuit breaker. Manually operated molded case circuit breaker, 15A, 3 pole. Furnish with auxiliary contacts and shunt trip. Auxiliary contacts shall indicate breaker position. Wire the closed position contact to the PLC to provide alarm indication any time the breaker is not closed (either tripped or manually opened). Wire the shunt trip to the overload.
  2. VFD Selector Switch. Three-position VFD/BYPASS/OFF.
  3. VFD.
  4. Contactor for normal run operation. Connect to the load side of the VFD.
  5. Overload relay. Connect to function in both VFD and Bypass modes. Wire into breaker shunt trip.
  6. Nameplate on the door above the indicator lights identifying the VFD for Radiator No. 1, etc.
  7. LED indicating lights, left to right.
    - Top Row
      - 1) VFD Mode (green).
      - 2) VFD Running (green).
      - 3) Bypass Mode (amber).
    - Second Row
      - 1) VFD Fault (red).
      - 2) VFD Breaker Open (red).
      - 3) Spare (amber).
  8. Cooling fan, with filter and grille. When more than one VFD is installed in a common enclosure install a minimum of two fans. Mount fan(s) at top or bottom of enclosure and provide an exhaust grille in the opposite location, on the front of the enclosure. Fan(s) shall run continuously.
  9. Provide a single control wiring harness for control from the master section. Provide a single cable connection for VFD power from the bus through the VFD main circuit breaker.
  10. LED panel illumination kit, complete with door switch.
  11. Install terminal blocks in a single location near the top of the VFD enclosure for field connection of all external control and power wiring for all VFD's. Use shielded wiring or separate routing for conductors on the load side of all VFDs.

12. Provide power for radiator control and temperature sensors from the 24VDC switchgear control power.
13. Provide ambient air temperature sensor permanently installed within the VFD section. For systems with more than one VFD section, provided one sensor in each section.

### **PART 3 - PROGRAMMING, TESTING AND PACKAGING**

#### **3.1 SYSTEM PROGRAMMING AND SOFTWARE INSTALLATION**

- A. The Fabricator shall furnish and install the following software on the Data Storage Server. All licenses shall be in the name of the Alaska Energy Authority
  1. AB Studio 5000 Mini Edition EN License (PLC programming software).
  2. Woodward Toolkit Easygen configuration software or ComAp equal.
  3. Schweitzer AcSELeRator. (FPR software, latest version).
  4. Square D (SOMOVE). Or software for VFD provided.
  5. SHARK metering software (latest version).
  6. LogMeIn (AEA will provide installation credentials)
  7. Any other devices installed in the switchgear that have custom software.
- B. The Fabricator shall provide all PLC and GC programming as required to meet the requirements and intent of this specification.
- C. The Fabricator shall prepare a complete tag list of all input/output devices including, but not limited to, the PLC, GC, and all monitored and controlled devices. The Tag List shall be in the form of a spreadsheet. If additional I/O or tags are requested by the Authority the Fabricator shall provide that information. The tag list shall be used in the development of the SCADA system. A copy of the final tag list shall be included in the O&M Manual.
- D. The Fabricator shall install the SCADA software as specified in 26 23 05.
- E. Upon completion of testing the Fabricator shall archive copies of all software packages, setup files, final program settings, and the Tag List on the server.
- F. The Fabricator shall provide the Authority a USB thumb drive with all archived files, the End User License Agreement (EULA) and original licensed copy of each software package.
- G. The Fabricator shall provide the Authority a detailed list of all required usernames and passwords for all software and programs.

#### **3.2 INSPECTION AND WITNESS TESTING**

- A. The Authority shall have the right to inspect, at the factory, all equipment covered by these specifications any time during manufacture and assembly and to be present during any equipment tests.
- B. The Authority may visit the manufacturing facility for final performance testing. The Fabricator shall make a technician available to the Authority to assist in the

inspection and witness test of the switchgear. The technician shall instruct the Authority in all functions of the equipment.

- C. The Fabricator shall notify the Authority two weeks in advance of the scheduled test date. Fabricator shall not ship equipment without approval by the Authority of the shop test reports. If the Fabricator ships the equipment without allowing the Authority to witness testing of the equipment, or before the Authority accepts the equipment test, the Authority reserves the right to have a third party test the equipment in Anchorage, Alaska or at the F.O.B. destination. All costs associated with a third-party test shall be deducted from the final payment. If the switchgear fails any test, the Fabricator shall be responsible for correction of all deficiencies, retesting, and proving the switchgear operates as specified and meets the requirements of these specifications with no increase in the contract price.

### 3.3 FACTORY TESTING

- A. Prior to shipping, the Fabricator shall perform factory tests at the shop where the switchgear is assembled. Provide certified copies of all manufacturers' test data and results. Test procedures shall conform to ASME, IEEE, and ANSI standards, and NEMA standard practices section on testing, as appropriate and applicable.
- B. The Fabricator shall provide all required equipment and measuring and indicating devices required to perform the tests indicated. All devices shall be certified correct or correction data furnished for the device.
- C. The Fabricator shall calibrate and set all protective devices.
- D. Tests shall indicate satisfactory operation of specified performance. If the Authority elects to witness the testing, prior to actual witness testing by the Authority, the Fabricator shall conduct sufficient tests and provide the test reports to the Authority to ensure that when the witness test is performed, the equipment will operate as specified.
- E. Prior to factory testing the SCADA system shall be fully functional as specified in Section 26 23 05. The switchgear control system shall be fully tested using the SCADA system as specified herein. The OIU shall be fully functional and the switchgear shall be fully tested using the OIU. All alarm and control functions specified shall be available and indicated on the OIU.
- F. At a minimum, perform the following operational tests:
  - 1. Verify that the system performs the sequence of operations as specified.
  - 2. Verify that the equipment performs each task as specified.
  - 3. Verify all engine and generator protection functions for each GC.
  - 4. Verify all feeder protection functions for the FPR.
  - 5. Verify that the PLC starts and stops each generator based on the requirements of the demand table specified herein.
  - 6. Verify that each annunciation point operates correctly. For external alarms, simulate the alarm.

7. Verify that all screens on the SCADA display correct data. Use an external computer to verify remote access for SCADA.
  8. Test each VFD. Impress a 4-20 mA signal and verify the output of the VFD. Bench test completed unit. Provide a 3-phase motor of the size indicated and verify that the motor operates based on the 4-20 mA input signal.
  9. Disconnect 120-volt AC control power in the master section to verify that the system continues to operate without interruption from the 24VDC source and that the server continues to operate from the UPS.
- G. FPR testing. Provide the following testing of the feeder protection relay.
1. After factory assembly and wiring of equipment, conduct functional tests to prove correct wiring and operation of equipment. The tests shall include but not limited to the following:
    - a. Input 3-phase AC signal voltage to all external terminal blocks where potential transformer connections shall be made. Verify with a voltmeter and phase angle meter that the correct voltage is present at all points indicated.
    - b. Input 3-phase AC signal current to all external terminal blocks where current transformer connections shall be made. Verify with an ammeter, current test plug, and phase angle meter, where possible, that the correct current is present at all points indicated. Currents through devices not provided with current test jacks may be verified with a clamp-on ammeter.
    - c. Operate each control switch and selector switch in all positions to verify that all control circuits operate as shown on the schematic diagrams.
    - d. Verify proper operation of all blocking, closing, and tripping contacts of the FPR.
    - e. Simulate remote contacts and switches by jumpers at the appropriate external terminal blocks to verify proper circuit operation.
    - f. Visually verify that all indicating lights operate properly.
- H. The switchgear equipment and circuit breakers shall receive the following tests:
1. Equipment.
    - a. Low frequency dielectric test.
    - b. Grounding of instrument cases.
    - c. Control wiring and device functional test.
    - d. Polarity verification.
    - e. Sequence test.

- f. Low frequency withstand voltage test on major insulation components.
      - g. Low frequency withstand test on secondary control wiring.
    - 2. Main Bus: Megger test at 1000 volts each bus to ground and phase-to-phase.
    - 3. Contactors:
      - a. Coil check test.
      - b. Clearance and mechanical adjustment.
      - c. 300 Electrical and mechanical operation test.
      - d. Conductivity of current path test.
  - I. Tests that are provided by the manufacturer of the equipment need not be duplicated. Provide documentation that the manufacturer's test was performed and passed.
  - J. Perform multiple repetitions of individual operations as required by the Authority to adequately demonstrate satisfactory operation of all functions.
  - K. Include complete test reports in the Operation & Maintenance Manual documenting all factory tests performed.

### **3.4 FIELD TESTING**

- A. Upon completion of field installation the Contractor shall fully test the switchgear.
- B. Prior to field testing the SCADA system shall be fully functional as specified in Section 26 23 05. The switchgear control system shall be fully tested using the SCADA system as specified herein. The OIU shall be fully functional and the switchgear shall be fully tested using the OIU. All alarm and control functions specified shall be available and indicated on the OIU.
- C. Test procedures shall conform to ASME, IEEE, and ANSI standards, and NEMA standard practices section on testing, as appropriate and applicable. The Contractor shall provide all required equipment and measuring and indicating devices required to perform the tests indicated. All devices shall be certified correct or correction data furnished for the device.
- D. Field Testing and Commissioning shall coincide with Substantial Completion. Provide written notice to the Authority in accordance with 01 77 00 Contract Closeout. The Authority reserves the right to witness all tests.
- E. Prior to performing tests verify that all field assembly is complete, all sections have been fastened to floor, all shipping splits and bus connections have been torqued to manufacturer's recommendations, and all interconnecting wiring has been connected and secured.

- F. Perform adequate tests prior to Substantial Completion to verify that the switchgear is fully functioning. At a minimum, provide the following operational tests:
1. Verify that the system performs the sequence of operations as specified under Part 4.
  2. Verify all protective relay functions for the FPR and GC.
  3. Verify all engine and generator protection functions for each GC.
  4. Verify all feeder protection functions for the FPR.
  5. Verify that the PLC starts and stops each generator based on the demand table requirements specified under Part 4.
  6. Verify that each VFD operates properly.
  7. Verify that each annunciation point operates correctly. For external alarms, simulate the alarm.
  8. Verify that all screens on the SCADA display correct data. Use an external computer to verify remote access for SCADA.
  9. Verify that all trending functions are operational and are being archived on the data storage server.
  10. Disconnect 120-volt AC control power in the master section to verify that the system continues to operate without interruption from the 24VDC source and that the server continues to operate from the UPS.
- G. Repeat tests during Substantial Completion as required by the Authority to adequately demonstrate satisfactory operation of all functions.

### **3.5 PACKAGING**

- A. Shipping splits shall be provided in the switchgear for ease of handling in the field. The switchgear shall be shipped in splits as indicated on the project design drawings or as required for field installation.
- B. The switchgear shipping splits shall be individually shrink wrapped, packed, crated and rigidly braced to protect from damage during shipment, handling and storage. Each section shall be crated so that it can be shipped upright or placed flat on the backside of the panel. The packaging shall be waterproof. Moisture absorbent packages shall be placed in each compartment to ensure that moisture does not condense inside the switchgear.
- C. All other included components (spare parts, loose items, etc.) shall be packaged individually in waterproof wrapping. Each individual component package shall then be packed in a box or crate, and each box/crate wrapped in waterproof wrapping to prevent corrosion to the components during extended periods of outside storage. All boxes or crates shall be palletized onto the minimum number of pallets, as required for the quantity and size of the boxes/crates.
- D. Suitable attachments shall be provided on the bottom of the shipping assemblies for lifting or moving the equipment to final location. Provisions shall not

necessitate disassembly of the equipment. Instructions for lifting the switchgear shall be provided. Additionally, the weight and center of gravity shall be provided.

- E. Exterior of crating shall be clearly marked with the community name and the contents identification (e.g. "Community" Gen #2).
- F. Two copies of the packing slip identifying the quantity of pallets, the crates/boxes on each pallet, and the listing of component packages within each box/crate shall be provided to the Owner.

#### **PART 4 - MONITORING, CONTROL, AND SEQUENCE OF OPERATION**

##### **4.1 ENGINE MONITORING**

- A. The GC shall monitor temperatures, alarms and status of the following engine devices:
  - 1. Monitor engine speed, jacket water temperature, lubricating oil pressure, and fuel flow rate from the engine ECU via J1939.
  - 2. Engine Runtime. Log and maintain engine runtime. Time shall be expressed in hours. Note that when the engine ECU is off, the Engine Hours shall continue to display the hours at the time the engine stopped.
  - 3. Hours until Engine Service. Using the engine runtime from the GC, the PLC will log and maintain hours until engine service required. Time shall be expressed in hours.
  - 4. Generator Lockout Switch. Connect key switch to GC Discrete Input 5.
  - 5. Oil Level Switch. Monitor status of engine-mounted oil level switch through GC Discrete Input 3. A normally open switch closes when the oil level drops below or rises above a pre-determined level.
  - 6. Exhaust Gas Temperature. Monitor exhaust temperature through GC Analog Input 1 via a 4-20mA signal converter. The exhaust gas temperature sensor is a 2-wire 100 ohm RTD or Type K thermocouple.
  - 7. Air Filter Vacuum. Monitor air vacuum through GC Analog Input 2 via a 4-20mA signal converter. The air filter vacuum transmitter is 4-20mA, -408" H<sub>2</sub>O to 0" H<sub>2</sub>O range. Power supply for the signal converter shall be provided from the GC power supply.
  - 8. Intake Air Temperature. For engines with a charge air cooler, monitor intake air temperature through GC Analog Input 3 via a 4-20mA signal converter. The intake air temperature transmitter is 4-20 mA, 20°F to 240°F range. Power supply for the signal converter shall be provided from the GC power supply. Signal shall be series looped through the GC and the engine charge air cooler VFD.

##### **4.2 AMBIENT AIR TEMPERATURE MONITORING**

- A. The PLC shall monitor the following air temperatures.

1. Outside air temperature.
2. Inside air temperature.
3. VFD section temperature.

#### **4.3 FUEL AND OIL SYSTEM MONITORING**

A. The PLC shall monitor and provide the following:

1. Plant Total Fuel Consumption and Last Day Tank Fill Cycle Quantity. The PLC shall calculate the total plant fuel consumption and the last day tank fill cycle quantity from the day tank supply meter. The day tank meter pulser provides one pulse per each gallon of fuel.
2. Plant Fuel Efficiency. The PLC shall calculate the overall plant fuel efficiency (kWh/gallon). At the end of each day tank fill cycle, divide the total kWh generated since the end of the last fill cycle (from bus power meter) by the gallons of fuel pumped into the day tank during the latest fill cycle.
3. Low Fuel Level Alarm. A normally closed contact on the day tank control panel will open when the fuel level in the day tank drops below a preset level.
4. Generator Fuel Consumption. The PLC shall read the instantaneous fuel flow rate (gallons per hour) and the total fuel consumption (gallons) from the engine ECU via J1939.
5. Using remote I/O monitor status of the day tank including:
  - a. Day Tank Control Power.
  - b. Day Tank Pump P-DF1 Run.
  - c. Day Tank Actuator Valve Open.
  - d. Day Tank Low Level Alarm.
  - e. Day Tank Overfill Alarm.
  - f. Day Tank Pump P-DF1 Time Out Alarm.
  - g. Day Tank Filter Water Alarm.
6. Using remote I/O monitor status of the used oil blender including:
  - a. Blender Control Power.
  - b. Blender Pump P-DF2 Run.
  - c. Blender Pump P-UO2 Run.
  - d. Blender Hopper Low Oil Level.
  - e. Blender Filter #1 Plugged.
  - f. Blender Filter #2 Plugged.

7. Using the EVO 200 level monitoring system monitor the level and temperature of the fluid in the Day Tank, Used Oil Hopper, and Intermediate Tank.
8. Plant Total Used Oil Blending System Consumption, Last Oil Blend Cycle Quantity and Overall Blended Oil Percentage. The PLC shall calculate the total used-oil use, the last blend cycle quantity, and the overall percentage of blended oil in the fuel supply. The data for these calculations comes from the day tank meter pulser (at one pulse per each gallon of fuel) and the EVO 200 level monitor.

#### **4.4 COOLING SYSTEM MONITORING**

- A. The PLC shall monitor the following:
1. Low Coolant Alarm. Monitor low coolant level switch status. A normally closed switch in the coolant piping will open when the coolant drops below a preset level.
  2. Engine Coolant Return Temperature. Monitor engine coolant return temperature via a 4-20 mA, 20°F to 240°F range temperature transmitter. Power supply for the transmitter shall be provided from the switchgear 24VDC power supply.

#### **4.5 HEAT RECOVERY SYSTEM MONITORING**

- A. The PLC shall monitor the following:
1. Heat Recovery Supply Temperature. Monitor heat recovery supply temperature via a 4-20 mA, 20°F to 240°F range temperature transmitter. Power supply for the transmitter shall be provided from the switchgear 24VDC power supply.
  2. Heat Recovery Return Temperature. Monitor heat recovery return temperature via a 4-20 mA, 20°F to 240°F range temperature transmitter. Power supply for the transmitter shall be provided from the switchgear 24VDC power supply.
  3. Heat Recovery Pressure. Monitor heat recovery fluid pressure via a 4-20 mA, 0 to 60 PSIG range pressure transmitter. Power supply for the transmitter shall be provided from the switchgear 24VDC power supply.
  4. Heat Recovery Flow Rate. Monitor heat recovery fluid flow rate via a 4-20 mA, 0 to 100 GPM range flow meter. Power supply shall be provided from the switchgear 24VDC power supply.

#### **4.6 OIU DISPLAY**

The OIU shall provide the operator local access to the demand system setup parameters and shall display all screens required for system monitoring. The OIU shall communicate with the PLC Pro-Soft card via ModBus TCP for tag information. The OIU programming and development of all display screens shall be provided by the Fabricator, see SCADA specification 26 23 05. The Fabricator shall program the following functions and display

the following data. All multiplication factors or other proportional scaling of the raw data shall be provided by the Fabricator so the data provided will not need to be modified.

- A. Demand Control – Generator kW rating (overload level), raise level set point, raise level time duration, lower level set point, lower level time duration.
- B. Generator Control – Amount of time each generator will run off-line before it is shut down (cooldown duration). Enable/disable droop unloading and the kW load or amount of time before going offline. Provide Lead/lag selection between two identical generators.
- C. Engine/Generator Data:
  - 1. Alarms – All engine/generator alarm conditions
  - 2. Status of the breaker (open or closed)
  - 3. Phases A, B, and C voltage, current, and power factor
  - 4. Generator Frequency (Hz)
  - 5. Engine Speed (RPM)
  - 6. Engine Run Time (hours)
  - 7. Hours until Engine Service (hours)
  - 8. Engine Water Jacket Temperature (°F)
  - 9. Engine Exhaust Temperature (°F)
  - 10. Engine Oil Pressure (PSI)
  - 11. Engine Air Cleaner Vacuum (in-H<sub>2</sub>O)
  - 12. Engine Fuel Flow Rate (GPH)
  - 13. Engine Total Fuel Use (Gal)
  - 14. Engine Oil Level Switch
  - 15. Engine ECU – All available data from Engine Control Unit (ECU)
  - 16. Lead Engine - where two engines are the same capacity
  - 17. Intake Air Temperature - for engines with a charge air cooler
- D. Bus/Station Service Power Data:
  - 1. Phases A, B, and C voltage, current, and power factor for bus
  - 2. Metering – All available data from bus meter
  - 3. Phases A, B, and C voltage, current, and power factor for station service
  - 4. Metering – All available data from station service meter
  - 5. Trip indication for station service breaker.
- E. Feeder Data:
  - 1. Position indication for each feeder breaker
  - 2. Trip indication for each feeder breaker.

- F. Ethernet I/O Device Level Ring Status
- G. Fuel/Oil System Data
  - 1. Fuel level & temperature in day tank, used oil hopper, and intermediate tank
  - 2. Plant total fuel use
  - 3. Plant total fuel efficiency
  - 4. Plant previous 30 minute fuel efficiency
  - 5. Day tank last fill quantity
  - 6. Day tank pump P-DF1 running
  - 7. Day tank low level alarm
  - 8. Day tank overfill alarm
  - 9. Day tank pump P-DF1 time out alarm
  - 10. Day tank actuator valve open
  - 11. Day tank filter water alarm
  - 12. Last oil blend quantity
  - 13. Overall oil blend percentage
  - 14. Plant total used oil blended
  - 15. Blender pump P-DF2 running
  - 16. Blender pump P-UO2 running
  - 17. Blender used oil hopper low alarm
  - 18. Blender Filter #1 and #2 plugged alarms
- H. Ambient Temperature Data
  - 1. Outside Air Temperature
  - 2. Inside Air Temperature
  - 3. VFD Section Temperature
- I. Engine Coolant Data
  - 1. Low engine coolant level alarm.
  - 2. Engine coolant return temperature
- J. VFD Data – All data available from each variable frequency drive, quantity as indicated on the communication diagram of the attached drawings.
  - 1. Radiator coolant temperature
  - 2. Intake Air Temperature - for engines with a charge air cooler
  - 3. VFD breaker open
  - 4. VFD frequency

5. VFD status (On, Off, Bypass, Running, Fault)
- K. Heat Recovery System Data
1. Supply Temperature
  2. Supply Temperature Signal Lost
  3. Return Temperature
  4. Return Temperature Signal Lost
  5. System Pressure
  6. Flow Rate
  7. No Load Warning
  8. Loss of Pressure
  9. Loss of Flow
  10. Recovered Heat Output
  11. Total Recovered Heat Delivered

#### **4.7 GENERAL CONTROL SPECIFICATIONS**

- A. The switchgear shall automatically and manually connect and parallel all generators to the switchgear main bus.
- B. The PLC shall control the automatic load demand system and overall sequencing, starting, and stopping of the engine generators. The SCADA on the OIU shall provide operator access to the demand system and shall display the current demand system status.
- C. The GC shall control all functions and features of the generator under both automatic and manual control. The GC shall start, stop, synchronize, and provide load sharing of the generator. All GC's shall communicate via CANbus for load sharing. If the communications bus is disabled, each GC shall be fully capable of operating the individual generator without the aid of the PLC.
- D. The Fabricator shall review all project design drawings and information provided and shall incorporate all required engine and generator safety functions into the GC.

#### **4.8 GENERATION SEQUENCE OF OPERATION.**

- A. A complete and successfully operating system shall be provided for starting, stopping, and paralleling, both automatically and manually, all engine generators. The following paragraphs describe the basic functional requirements of the system. The Fabricator shall be responsible for the detailed design to provide a safe and satisfactorily functioning system.
- B. The PLC shall monitor the system load and status and shall control automatic start and stop of each unit. Time delays shall be incorporated in the PLC that shall be adjustable through the OIU as required. Use relays in conjunction with PLC logic for automatic start/stop. Failure of the automatic control system shall not prevent

the manual operation of the system to start, stop, or synchronize any one, or all, of the generating units.

- C. The GC shall control engine speed, voltage compensation, synchronization, and generator breaker operation.
  - 1. The GC shall perform all engine and generator safety functions. Provide annunciation through the PLC via Point I/O blocks.
  - 2. The GC shall perform the cranking and disconnecting of the starter.
  - 3. The GC shall turn on the run signal to the ECU then have a 5 second delay before cranking the starter to ensure fuel is up to pressure. During the delay the GC shall display a banner indicating pre-start mode.
  - 4. The GC shall make up to 4 attempts to start an engine with a pre-set cranking time of 10 seconds and a 10 second pause between each attempt. If the engine does not start after the fourth time, the OVERCRANK and ENGINE ALARM lamp will illuminate and a FAIL TO START message will appear on the monitoring screen.
  - 5. The GC shall control the engine speed using 0.25-4.75VDC signal to the engine ECU.
  - 6. The GC shall control the voltage regulator through the voltage regulator auxiliary voltage bias input.
  - 7. Generator Lockout Switch. When in the OFF position the switch shall disable the GC and prevent engine starting.
- D. Upon activation of the dead bus relay the feeder breaker shall open. This function shall be independent of the PLC and shall operate in all modes.
- E. Automatic Operating Conditions.
  - 1. With the System Mode Switch in the “AUTO” position and each GC in “AUTO” mode, the following sequences of operation shall be performed:
    - a. Dead-Bus Startup: All available generators shall start and come up to rated speed. The generators shall be started sequentially in order of generator number with a 15 second delay between each start signal. The first unit to stabilize will close to the dead bus. The remaining units shall auto-synchronize to that unit and close to the bus in sequence. After 15 second delay after the last generator comes on line, the PLC shall close the feeder breaker and energize the feeder. On systems with two feeder breakers the PLC shall close feeder breaker #1 and then after an additional time delay of 15 seconds, the PLC shall close feeder breaker #2. If available, a minimum of two units shall be running and synchronized prior to energizing the feeder. If only one generator is available for operation, the PLC shall use that unit to energize the feeder.
    - b. With all available units operating and all GC's in “AUTO” mode, the PLC shall monitor the bus load and determine which unit best

- fits the demand load. The PLC shall signal the GC to unload and shut down any unit not needed to meet the load.
- c. When the load exceeds a preset percentage of the prime power rating of a unit, the PLC shall signal the GC to automatically start, synchronize, and connect to the bus another unit. Predetermined demand level set points in the PLC shall determine which unit should be placed online. If that unit is not available, the PLC shall automatically switch to another unit. The PLC shall continue to monitor load and signal the appropriate GC to start, synchronize, unload, and stop as required, to match the appropriate unit to the load.
  - d. Provide lead/lag control for multiple generators of the same capacity.
  - e. When any GC is not in “AUTO” mode, the PLC shall skip that unit and switch to the next available unit. Any time a unit’s GC is switched from “STOP” or “MAN” to “AUTO” mode, the PLC shall compare the unit with the operating unit and load to determine which unit is more appropriate for the load. If the new unit is more appropriate, the PLC shall send a command signal to the GC to start, synchronize, and connect the unit to the bus and unload and shut down the other.
  - f. When one unit is operating and is dropped from the bus, for any reason, the PLC shall signal all GC’s to automatically start all remaining available units and perform a dead bus start up sequence as previously specified. After the bus is stabilized, the PLC shall resume normal demand level control operation and signal the GC’s to shut down units not required to carry the load.
  - g. When two units are operating and one of the units is dropped from the bus for any reason, the PLC shall check the raise level and overload level of the unit operating. When the system demand exceeds the raise level of the operating unit, the PLC shall signal the GC to start the next unit and place it in service after the raise level time delay times out. When the system demand exceeds the overload level of the operating unit, the PLC shall immediately signal the GC to start the next unit available under the automatic demand system and place it in service within 10 seconds.
  - h. The GC shall provide a programmable cool down period for each unit prior to engine shut down. Each unit shall operate at rated speed for 3 minutes, and then automatically stop the engine.
  - i. When the GC of an operating unit is switched to “MAN” mode, the PLC shall signal the GC to start another unit, as specified above. The unit placed in “MAN” mode will continue to run until the GC is switched to “STOP” or placed in “AUTO”.

- j. When the GC of an operating unit is switched to “STOP” mode, the GC will check to see if any other generators are online. If there is another unit on-line, the GC will shed the load to the other unit, open the generator breaker, and shut off the engine after a cool-down period. If there is no other unit on-line, the generator breaker will open and the engine will shut off after a cool-down period.
  - k. Upon normal shut down of a unit, all parameters shall be automatically reset to allow the unit to be operated again, either manually or automatically, without further reset action.
2. When the System Mode Switch is switched from the “AUTO” position to the “MAN” position while units are operating in automatic mode, the system shall continue to operate in the present state. If the Mode Switch is moved back to the “AUTO” position, the PLC shall revert to operation in the automatic demand mode.
  3. Demand Control: The automatic Demand Control System shall provide 2 levels of starting control and 1 level of stopping control.

The 2nd level of starting control is considered the “overload” level and it shall be equal to the generator prime power rating. When the load equals or exceeds the “overload” level the system shall immediately go to the next higher demand level.

The 1st level of starting control is considered the “raise” level and it shall normally be equal to 90% of the generator prime power rating. When the load equals or exceeds the “raise” level for 20 seconds, adjustable, the system shall go to the next higher demand level.

The stopping control is considered the “lower” level and it shall normally be equal to 80% of the generator prime power rating. When the load is less than the “lower” level for 120 seconds, adjustable, the system shall go to the next lower demand level.

The Demand Control System shall have multiple demand levels. The highest demand level will command all units to start and go on-line.

**Nikolai Power Plant Demand Control**

Demand Control	Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	#2 or #3	100	90	---
Level 2	#1	150	135	80
Level 3	#1 & #2 or #3	250	225	120
Level 4	All	350	---	200

Note: Nikolai Generator #2 and #3 are equal capacity and the operator must select the lead unit using the OIU. If the lead unit faults or fails to start, the Demand Control shall automatically select the other unit.

**Venetie Power Plant Demand Control**

Demand Control	Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	#1	100	80	---
Level 2	#2 or #3	225	200	70
Level 3	#1 & #2 or #3	425	380	180
Level 4	All	550	---	300

Note: Venetie Generator #2 and #3 are equal capacity and the operator must select the lead unit using the OIU. If the lead unit faults or fails to start, the Demand Control shall automatically select the other unit.

- F. Manual Operating Condition. When the System Mode Switch is in the "MAN" position each generator GC shall control the respective generator in isochronous mode. The GC must be placed in MAN mode to start, stop, and control the generator. All functions shall be manually executed through the GC. If multiple generators are placed online the GC's shall proportionally share load.
- G. Engine and Generation Alarm Conditions and Sequences. Note that these apply to both Auto and Manual operation.
  - 1. Provide the following types of alarm sequences for each condition listed below:
    - a. Type 1 (Engine Alarm Soft Shutdown):  
Upon alarm condition bring another generator on line, unload the first generator, open the generator breaker, run engine through a cool down cycle, shut down engine, and illuminate "Alarm/Lockout" light and associated alarm annunciation light. Alarm light shall remain illuminated until the problem is corrected and the GC is manually reset. Note that this a Class B Easygen alarm with PLC assist to first start another generator and then take the first offline.
    - b. Type 2 (Engine Alarm Hard Shutdown):  
Upon alarm, immediately open the generator breaker and shut down without going through a cool down cycle. Illuminate "Alarm/Lockout" light and associated alarm annunciation light. Unit shall be locked out and alarm light shall remain illuminated until the problem is corrected and the GC is manually reset. Note that this a Class F Easygen alarm.

- c. **Type 3 (Generation Alarm):**  
Upon alarm, immediately open the generator breaker, run engine through a cool down cycle, shut down engine, and illuminate “Alarm/Lockout” light and associated alarm annunciation light. Unit shall be locked out and alarm light shall remain illuminated until the problem is corrected and the GC is manually reset. Note that this a Class D Easygen alarm.
2. For the following engine/generator alarm conditions perform the sequence indicated and illuminate the associated alarm light:
    - a. Low Oil Pressure - Provide a Type 1 soft shutdown when the oil pressure drops to the pre-alarm level of 14.5 psig, adjustable, and stays below that level for 5 seconds, or if the pressure transducer signal is lost. Provide a Type 2 hard shutdown when the oil pressure drops to the alarm level of 10 psig, adjustable.
    - b. Oil Level - Provide a Type 1 soft shutdown when the oil level switch closes.
    - c. High Coolant Temperature - Provide a Type 1 soft shutdown when the jacket water temperature reaches the pre-alarm level of 210°F, adjustable, and stays above that level for 30 seconds or if the temperature transducer signal is lost. Provide a Type 2 hard shutdown when the jacket water temperature reaches the alarm level of 215°F, adjustable.
    - d. Over Speed - Provide a Type 2 hard shutdown on overspeed.
    - e. Over Crank – Lock out engine if a unit fails to start when the over crank time delay has expired.
    - f. Running Timeout - Shut down the engine and lock it out if the engine runs without being placed online for 5 minutes, adjustable.
    - g. Battery Charger Failure – Illuminate the appropriate alarm light when an alarm is received from the battery charger. Note this alarm is for indication only and not shutdown.
    - h. Air Filter Plugged - Provide a Type 1 soft shutdown when the vacuum on the air filter exceeds the pre-alarm level of 15” H<sub>2</sub>O, adjustable, and stays above that level for 60 seconds or if the vacuum signal is lost. Provide a Type 2 shut down when the vacuum on the air filter exceeds the alarm level of 20” H<sub>2</sub>O.
    - i. High Intake Air Temperature - Provide Type 1 soft shutdown when intake manifold air temperature reaches 140°F, adjustable, and stays above that level for 30 seconds or if the temperature signal is lost. Note that this only applies to engines with a charge air cooler.
    - j. High Exhaust Temperature – Illuminate the appropriate alarm light when the exhaust temperature exceeds the alarm level of 900°F, adjustable, and stays above that level for 30 seconds or if the

- temperature signal is lost. Note this alarm is for indication only and not shutdown.
- k. Fail to Synchronize - Provide a Type 3 shutdown if a unit fails to synchronize after the preset time delay.
  - l. Over Current - Provide a Type 3 shutdown on operation of an overcurrent element.
  - m. Under Voltage - Provide a Type 3 shutdown on operation of an under voltage element, 90% of nominal voltage.
  - n. Over Voltage - Provide a Type 3 shutdown on operation of an over voltage element, 110% of nominal voltage.
  - o. Under Frequency - Provide a Type 3 shutdown on operation of an under frequency element, 58.2 Hz.
  - p. Over Frequency - Provide a Type 3 shutdown on operation of an over frequency element, 61.8 Hz.
  - q. Reverse Power - Provide a Type 3 shutdown on operation of a reverse power element, 10%.
  - r. Charge Air VFD Failure - If an alarm is received from the charge air cooler VFD (either VFD fault or circuit breaker open), illuminate the appropriate alarm light. Do not shut down or lock out the unit. Note that this only applies to engines with a charge air cooler.
3. For the following system alarm conditions perform the sequence indicated and illuminate the associated alarm light:
- a. Fire Alarm - Upon receipt of a contact closure from the fire suppression system, all engines shall be shut down immediately without going through a cool down sequence. The system shall remain in a lockout condition and no units shall be started either manually or automatically until the alarm is cleared.
  - b. Emergency Stop - Upon receipt of a contact closure from the Emergency Stop Pushbutton, all engines shall be shut down immediately without going through a cool down sequence. The system shall remain in a lockout condition and no units shall be started either manually or automatically until the alarm is cleared.
  - c. Low Coolant Level – Opening of the low coolant alarm contact on the system low coolant level switch, all engines shall be shut down immediately without going through a cool down sequence. The system shall remain in a lockout condition and no units shall be started either manually or automatically until the alarm is cleared.
  - d. Low Fuel Level - Opening of the low fuel alarm contact on the day tank control panel (separate external panel) indicates a low fuel level condition. The low fuel level indication shall start a time delay relay, 2 hours, adjustable, and illuminate the alarm lamp. If

the fuel level has not been corrected by the end of the timed interval all engines shall go through a Type 1 soft shutdown and the alarm lamp shall remain illuminated. The manual alarm reset button on the front of the switchgear master section will reset the timer relay for another interval and place the engines back in service if timed out. The reset function shall work any time during or after expiration of the timed interval.

- e. PLC Failure - Upon failure of the PLC the alarm light shall remain illuminated until the PLC is back in acceptable service.
  - f. System Not In Auto – When the System Mode Switch is changed from Auto to Manual the alarm lamp shall illuminate. The alarm lamp shall remain illuminated until the Mode Switch is switched back to Auto.
  - g. Feeder Breaker Trip – Upon over current, the feeder breaker shall immediately trip and the alarm lamp shall illuminate. The generator shall continue to operate at rated speed.
- H. Engine Service Alarm Conditions and Sequences. Note that this applies to Auto operation.
- 1. When an engine exceeds 300 service hours perform the sequence indicated below:
    - a. The Engine Alarm/Lockout annunciator is illuminated.
    - b. Demand control starts the next available engine, syncs it to the bus, closes the breaker, and transfers load.
    - c. A Type 1 shutdown is performed on the engine with service overdue.
    - d. Upon completion of the required engine service the operator shall press and hold the Service Hours Reset pushbutton for 10 seconds to reset the service interval to 300 hours. The operator shall then press the Alarm Reset pushbutton to clear the engine alarm. Once the service is complete and the alarm is cleared the operator shall put the engine back into Auto mode.
    - e. Note: If the required engine service is performed manually prior to the Engine Service Alarm condition, the operator shall follow the procedure above without alarm condition in order to reset the service interval to 300 hours and place the engine back in service.

#### **4.9 FEEDER BREAKER SEQUENCE OF OPERATION**

- A. Automatic Operation - When the System Mode Switch is in the “AUTO” position the feeder breaker shall operate under control of the PLC. The feeder breaker can be opened at any time by rotating the feeder control knob to the OPEN position. The PLC shall then perform a dead bus start sequence (start all available generators) and re-close the feeder breaker after the pre-set time delay.

- B. Manual Operation - When the System Mode Switch is in the “MAN” position and the bus is energized, the feeder breaker will operate under manual control. The feeder breaker shall close when the feeder control knob is rotated to the CLOSE position and open when the feeder control knob is rotated to the OPEN position.

#### 4.10 VFD SEQUENCE OF OPERATION

- A. General VFD Sequence of Operation. Each variable frequency drive shall operate as follows:
  - 1. When the VFD main circuit breaker is closed and the selector switch is in either the “VFD” or “BYPASS” position, power shall be provided to all control devices. Time delay shall be incorporated into the fault alarm such that there is no alarm due to initial powering up of the VFD.
  - 2. When the VFD main circuit breaker is open, the red “VFD Breaker Open” lamp shall illuminate and remote indication shall be provided to the PLC.
  - 3. When the 3-position selector switch is in the "OFF" position, the motor will not operate and power to all control devices will be off.
  - 4. When the 3-position selector switch is in the "Bypass" position, the motor shall operate at full speed and the "Bypass Mode" light shall be on. The VFD will not be in service and the contactor will be open. Provide remote indication that the VFD is in bypass mode from an auxiliary contact as indicated.
  - 5. When the 3-position selector switch is in the "VFD" position, the motor shall operate under control of the VFD and the "VFD Mode" light shall be on. Upon receipt of a run signal the contactor shall close, the motor shall operate, and the “VFD Running” light shall be on.
  - 6. Upon a fault of the VFD the red “VFD Fault” lamp shall illuminate and remote indication shall be provided to the PLC. Placing the selector switch in the “OFF” position shall clear the fault alarm indication.
  - 7. Upon activation of the thermal overload, the VFD main circuit breaker shall trip, the red “VFD Breaker Open” lamp shall illuminate and remote indication shall be provided to the PLC.
- B. Radiator Sequence of Operation. Each variable frequency drive for glycol coolant radiators shall operate as follows:
  - 1. The remote temperature sensor will sense Coolant Return Temperature and send a 4-20mA signal to the VFD where 20°F equals 4 mA and 240°F equals 20 mA. The operating temperature setpoints shall be adjustable through the OIU and scaled to display in °F.
  - 2. When the Coolant Return Temperature reaches the PID Reference Temperature setpoint the motor will start at minimum speed and ramp up to the required speed.
  - 3. Using its internal PID control, the VFD will modulate the fan speed as required to maintain Coolant Return Temperature at the PID Reference

Temperature setpoint. As the Coolant Return Temperature rises, the VFD will increase the speed of the fan motor up to 100%. Once the fan reaches the Minimum Speed, the VFD will maintain that speed until the Low Speed Time Out expires.

4. When the Low Speed Time Out expires the motor will stop. The motor will remain off until the Coolant Return Temperature rises to the Wake Up Temperature setpoint.
5. Configure the OIU to display the fan speed in percentage and the PID Reference Temperature and Coolant Return Temperature in °F.
6. The operating settings shall be set to the following values and shall be adjustable:
  - a. 20 = Min PID Feedback (20°F)
  - b. 240 = Max PID Feedback (240°F)
  - c. 1 = rSL (Wake Up Threshold)
  - d. 175°F = PID Reference Temperature
  - e. 0.93 = Proportional Gain
  - f. 0.3 = Integral Gain
  - g. 0 = Derivative
  - h. 6 Hz = Minimum Speed
  - i. 60 Sec = Low Speed Time Out
  - j. Ignore = Loss of Phase

- C. Charge Air Cooler Sequence of Operation. Each variable frequency drive for charge air coolers shall operate as follows:
1. The VFD shall operate the charge air cooler fan motor any time the respective engine is operating. Connect a contact from the respective GC to the VFD run relay as indicated.
  2. The remote temperature sensor will sense intake manifold air temperature and send a 4-20mA signal to the VFD where 20°F equals 4 mA and 240°F equals 20 mA. The PID Reference Temperature shall be adjustable through the OIU and scaled to display in °F. The 4-20 mA signal from the sensor shall be looped from the respective engine GCP through the analog input on the VFD. The GCP shall be configured to provide a readout that displays actual air intake manifold temperature in °F.
  3. Upon startup, the fan motor shall run for 30 seconds at full speed and then switch to minimum speed and ramp up to the required speed.
  4. Using its internal proportional control, the VFD shall modulate the fan speed as required to maintain temperature in the intake manifold at the PID Reference Temperature. Once the fan speed reaches a minimum speed of 10%, the VFD shall maintain that speed as long as the signal

from the remote temperature sensor is below the PID Reference Temperature. As the intake manifold air temperature rises, the VFD shall increase the speed of the fan motor up to 100%.

5. If the temperature is below the PID Reference Temperature, the motor shall operate at a minimum speed of 6 Hz as long as the run signal is on.
6. Configure the OIU to display the fan speed in percentage and the setpoint temperature and intake manifold air temperature in °F.
7. The operating settings shall be set to the following values and shall be adjustable:
  - a. 20 = Min PID Feedback (20°F)
  - b. 240 = Max PID Feedback (240°F)
  - c. Not Used = rSL (Wake Up Threshold)
  - d. 100°F = PID Reference Temperature
  - e. 0.2 = Proportional Gain
  - f. 0.1 = Integral Gain
  - g. 0 = Derivative
  - h. 6 Hz = Minimum Speed
  - i. Not Used = Low Speed Time Out
  - j. Ignore = Loss of Phase

#### **4.11 HEAT RECOVERY SEQUENCE OF OPERATION**

- A. The PLC shall perform the following functions. Note that all heat recovery alarms shall be tied to the dead bus signal to prevent alarm indication when the power system is off-line:
  1. Heat Recovery No Load Warning. When the heat recovery return temperature is greater than the heat recovery supply temperature for a minimum of 1 hour, the “NO LOAD ON HEAT RECOVERY” lamp shall illuminate. When the heat recovery supply temperature is a minimum of 1°F greater than the heat recovery return temperature the lamp shall turn off. If either the supply temperature or the return temperature signal is lost, the system shall provide the following message on the OIU “HEAT RECOVERY SUPPLY TEMPERATURE SIGNAL LOST” or “HEAT RECOVERY RETURN TEMPERATURE SIGNAL LOST”.
  2. Heat Recovery Loss of Pressure Alarm. When the heat recovery system pressure drops below 15 PSIG for a minimum of 15 minutes, the “HEAT RECOVERY LOSS OF PRESSURE” lamp shall illuminate. When the pressure rises above 18 PSIG the lamp shall turn off.
  3. Heat Recovery Loss of Flow Alarm. When the heat recovery system flow rate drops below 10 GPM for a minimum of 15 minutes, the “HEAT

RECOVERY LOSS OF FLOW” lamp shall illuminate. When the flow rate rises above 15 GPM the lamp shall turn off.

4. Recovered Heat Output. The PLC shall calculate the instantaneous rate of energy delivered based on the supply temperature, return temperature, and flow rate. A specific heat of 450 BTUH/GPM-F shall be used for the fluid.
5. Total Recovered Heat Delivered. The PLC shall calculate the total energy delivered in units of 100,000 BTU with no decimal places.
6. Engine Coolant Return High Temperature Alarm. When the engine coolant return temperature rises above 190°F for a minimum of 2 minutes, the “HIGH COOLANT RETURN TEMPERATURE” lamp shall illuminate. Lamp shall remain on until master reset button is pressed.
7. History. The PLC shall maintain a running total of energy delivered.

**END OF SECTION**

## **SECTION 26 23 05**

### **SCADA SYSTEM FOR PRIME POWER SWITCHGEAR**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE**

- A. The Work consists of providing a complete and operational Supervisory Control and Data Acquisition (SCADA) system, as specified herein. The SCADA system shall be provided by an experienced programmer, referred to as Developer.
- B. The Developer shall develop the SCADA system and programming for the Human Machine Interface (HMI), referred to herein as Operator Interface Unit (OIU), data storage server, and local and remote devices. The SCADA system shall include Supervisory and Trending application software, custom project software file(s), and other software and files required to make a complete and fully functional system.
- C. The Developer shall provide all labor, equipment, incidentals and resources as specified and needed to furnish, install, calibrate, test, start-up and place into service a complete SCADA system, as indicated herein.
- D. The Authority and Utility, herein referred to as Designee(s), shall maintain ownership and use of all custom project software files and documentation developed to meet the requirements of this solicitation. All SCADA Supervisory and Trending application software licenses provided under this solicitation shall be perpetual and shall include the legal right for the Authority and its Designee(s) to use the software for an indefinite period of time. The Authority and its Designee(s) shall have unlimited rights to install and operate the SCADA Supervisory and Trending application software, up to the number of software licenses issued, and to install, operate and modify the custom project files as needed, without the requirement to commit to on-going maintenance or service agreements, or renewal fees.
- E. The Developer shall fully test the SCADA system with the switchgear and generating equipment as specified herein and in Section 26 23 00 - Prime Power Switchgear.

##### **1.2 RELATED REQUIREMENTS**

- A. Section 26 05 00 - Common Work Results for Electrical
- B. Section 26 05 02 - Basic Electrical Materials and Methods
- C. Section 26 23 00 - Prime Power Switchgear

##### **1.3 SUBMITTALS**

- A. Provide submittals in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.
- B. Submit data sheets and catalog data showing all supplied features, options and configurations of the SCADA Supervisory and Trending application software.

- C. Submit specific software operating system and version, and quantity of licenses for each of the following: OIU, data storage server, Secure Serial to Ethernet Server, SCADA Supervisory and Trending applications.
- D. Provide a written narrative that describes the purpose and function of each device and the method of communication, i.e., LAN/Modbus TCP/CAN BUS/etc.
- E. Provide a written narrative that describes the methods/protocols available to access the SCADA system both locally (LAN) and remotely (internet), and how many users may simultaneously access the SCADA system (LAN and internet).
- F. Provide a written description of the SCADA system security encryption and authentication protocol.
- G. Submit screen shots of the proposed OIU screen custom project file(s). Provide a Tag list and narrative operating description of the project file(s).

#### **1.4 SCADA SYSTEM SOFTWARE**

- A. All SCADA Supervisory and Trending application software licenses and custom project files, as well as upgrades and maintenance described in the Warranty herein, shall be included in the Developer's bid price.

For the purpose of this solicitation the SCADA Supervisory application software is defined as:

- Machine-readable object code used for the supervision, control and monitoring of the programmable logic controller (PLC) and other switchgear and field devices. The Supervisory application software interacts with custom project file(s) that are configured and customized to display and control tags from the PLC and devices, as indicated in Section 26 23 00 - Prime Power Switchgear.

For the purposes of this solicitation the SCADA Trending application software is defined as:

- Software that provides the functions as described in Paragraph 2.2 - Trending
- B. For the SCADA system to function both the Supervisory application software and custom project files shall be installed on a client device. A client device shall include, but not be limited to, devices that operate on Windows 7 through 10, and excludes any Windows-based Server.
  - C. The Authority and its Designee(s) shall be able to upgrade the Supervisory and Trending application software and to edit, modify, change, and manipulate the custom project files to fit their requirements.
  - D. The Authority shall own outright all other software applications and files developed under this solicitation by the Developer without license and shall have full rights to the files and programming code and may distribute, modify, or install it on any number of computers that may be owned by the Authority or its Designee(s) without additional costs or fees.
  - E. For the purposes of this contract "other software applications and files" shall include but may not be limited to:

- Customized screens and parameters developed for use with the Supervisory and Trending application software. (i.e., custom project files).
- Any other software and interfaces developed between the Supervisory and Trending application software, custom project files, and other application software and files related to collecting and reporting power plant data via the SCADA system.

### **1.5 QUALITY ASSURANCE**

- A. The Developer is responsible for quality assurance and completion of all work identified in these specifications. All work shall be subject to evaluation and inspection by the Authority at all times to assure satisfactory progress, and to verify that work is being performed in accordance with the specifications.
- B. The SCADA system shall be furnished by a single Developer who shall assume all responsibility for providing a complete and integrated SCADA system.

### **1.6 DEVELOPER QUALIFICATIONS**

- A. The SCADA system shall be the product of a Developer who can demonstrate at least five (5) years of continuous satisfactory experience in designing, implementing, furnishing and installing comparable SCADA systems for remote installations.
- B. The Developer shall have a thorough working knowledge of remote, off-grid prime power electric power plant controls and operating practices.
- C. A list of five prior projects that key staff have worked on may be requested by the Authority after the bid opening and prior to award in order to verify Developer qualifications. The list shall include installation date, description of installation, and a reference contact for each installation.

### **1.7 DEVELOPER WARRANTY**

- A. The Developer shall warrant the work for a period of not less than one-year. The warranty period shall commence upon acceptance by AEA of field testing with the engine generators and final commissioning of the equipment.
- B. In the event of a failure of the system to perform all specified functions during the warranty period, the Developer shall promptly repair or replace any defective components and revise programming and settings as required to achieve full system function. The Developer shall assist the Authority as directed in determining causes of deficiency or failure.
- C. In addition to the specified requirements for SCADA system programming, testing, commissioning, and warranty work, during the one-year warranty period the Developer shall provide an additional twelve (12) hours of programming assistance and technical support to modify the SCADA as requested by the Authority or its Designee(s). These hours are in addition to any technical requirements specified for programming, start-up and commissioning efforts, and shall be included in the Developer's bid price. The programming assistance and technical support may be required to be provided at a single event or may be spread out over the year as

directed by the Authority or its Designee(s), and will be performed remotely from the Developer's office and not at the Utility location.

## **1.8 OPERATION AND MAINTENANCE MANUALS**

- A. See Section 26 23 00 - Prime Power Switchgear.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. The Developer shall provide a fully functional SCADA system as specified herein and to meet the requirements of Section 26 23 00 - Prime Power Switchgear.
- B. The SCADA system shall be compatible with the switchgear hardware.
- C. The SCADA system shall not require or depend on external hardware for activation, or internet access to function properly.
- D. The Supervisory system shall operate on a Secure Serial to Ethernet Server and read information directly from the PLC, switchgear and power plant devices via the power plant LAN.
- E. The Supervisory system shall not be dependent on connectivity to the internet, the PLC, the data storage server, or any Windows-based server to function properly.
- F. The SCADA system shall be accessible via remote and local devices operating on Microsoft Windows 7 through 10 operating systems.
- G. The Supervisory and Trending software may be separate and distinct programs.
- H. Multiple applications of the SCADA system shall run concurrently. The OIU screens, alarms and monitoring points shall be identical for all SCADA applications, regardless if accessed locally or remotely via the internet. The Developer shall provide a sufficient quantity of SCADA and Trending application software licenses such that all devices in the power plant, and no less than six (6) additional remote or local devices, shall be authorized to access the SCADA system concurrently.
- I. The Supervisory and Trending application software and custom project file(s) shall be relatively small in size and have a simple installation routine. The SCADA system and software installation shall tolerate low throughput and high latency connections, down to as low as 56kbs and 500ms delay without dropping.
- J. The OIU graphic interface shall be user friendly and have the capability without modification or setup to allow personnel with large fingers to use the touch screen without a mouse or keyboard.
- K. The Supervisory system shall start and stop engines, reset alarms, change demand levels and have a confirm action dialog box for critical functions, as well as maintain an alarm log for Type 1 alarms separately from the Master and Type 2&3 alarms (refer to 3.3.H – Alarm History Screens).
- L. The Developer shall maintain a secure FTP or web site with custom project files. Tag lists, installation and operating instructions, and other files necessary to install and operate the SCADA system, to be readily downloaded and installed.

- M. The Developer shall provide comments in the code that describe the function of each parameter for ease of future maintenance and changes.
- N. The SCADA system installation, setup and modification shall be capable of being performed remotely via low bandwidth internet access. See Section 27 05 10 - Communications and Data Service for internet service requirements.
- O. Provide secure encryption with password protection.

## 2.2 TRENDING

- A. The Developer shall provide, configure, test and implement a historical database on the switchgear data storage server for historical data archiving, analysis, reporting, trending and system back-up of all data presented by the SCADA system. All historical data shall be fully synchronized and time-stamped, using a single time series (clock), so that historical data from all monitored devices are compared to a single time series.
- B. The SCADA system shall include features for the management of historical data. The SCADA system shall record historical values of analog variables on a periodic basis and values of digital variables on an event basis (change of state). The historical database must be capable of storing a minimum of one (1) year of historical data. All historical data shall be recorded on the switchgear data storage server. Historical files more than one (1) year old shall be automatically deleted.
- C. Trending data from the historical database shall be accessible and exportable both locally and remotely. The section of the trend to be exported shall be selectable by clicking and dragging the mouse across the trend. Any portion of the historical database shall be exportable. Data shall be exported to CSV or TXT formatted files, or similar file system as approved by the Authority. Exported files shall be of a manageable size compatible with the internet requirements of Paragraph 2.1. Exported trend data shall be readily capable of being printed or plotted to Adobe pdf format or to a designated printer.
- D. Refer to Paragraph 3.4, Trending Application Tags, for representative example of historical data to be archived and available for trending.

## 2.3 SECURITY

- A. Password Protection. Provide the following access password protection:
  - 1. Viewing only. In this level of access the viewer will be able to view the SCADA system but will not be able to modify any file or setpoint.
  - 2. Administrator. In this level of access, the viewer will be able to change the demand levels and timers, change the lead generators, remote start and stop engines, and perform other functions as directed by the Authority.
- B. The Developer shall provide a description of the SCADA system security encryption and authentication protocol for review and approval.
- C. The Developer shall provide a detailed list of all required usernames and passwords for all software and programs.

### **PART 3 - EXECUTION**

#### **3.1 FACTORY TESTS**

- A. Prior to factory testing of the switchgear, the SCADA Supervisory system shall be fully functional as specified in Section 26 23 00 - Prime Power Switchgear.
- B. The switchgear control system shall be fully tested using the SCADA Supervisory system as specified herein.
- C. The OIU shall be fully functional and the switchgear shall be fully tested using the OIU. All alarm, indication, and control functions specified shall be available and indicated on the OIU.
- D. The SCADA Trending application shall be factory tested to the extent practicable. Refer to Section 01 11 13 – Summary of Work for functional testing and commissioning requirements.

#### **3.2 FIELD TESTING AND TRAINING**

- A. The Developer shall provide a minimum of 8 hours of training for the Authority and Utility personnel. Training shall be provided separately for each Utility. Training does not need to be on site but the Developer must be available by telephone and internet.
- B. Training shall occur after substantial completion of the project using the actual power plant equipment. Coordinate with the Authority and Utility to ensure that the appropriate individuals are available.
- C. During training, make modifications to the SCADA system programming as directed by the Authority to incorporate any system control modifications identified during testing, startup, or commissioning.

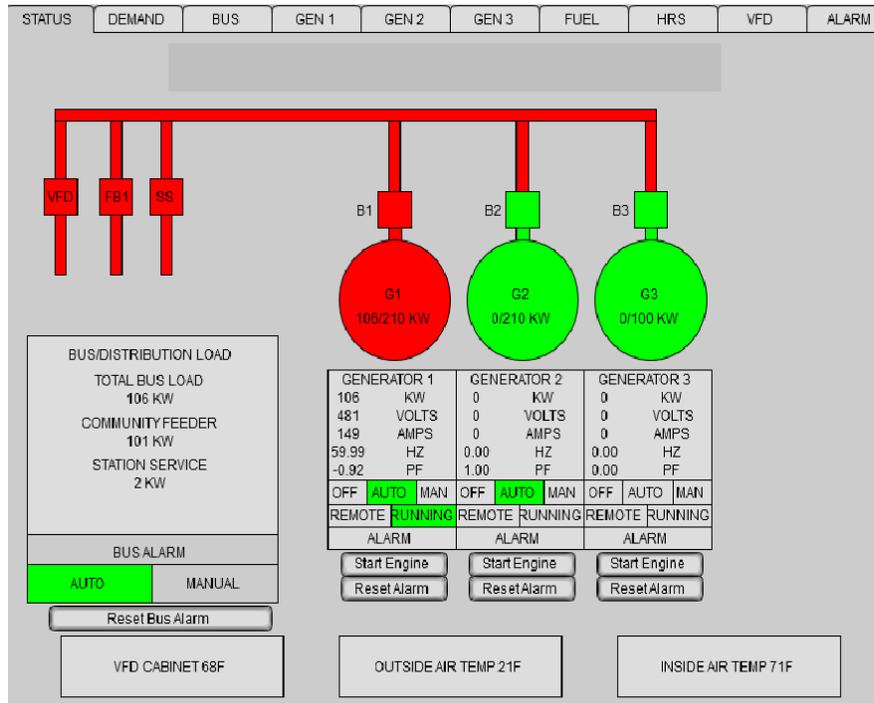
#### **3.3 WARRANTY PERIOD SUPPORT**

- A. The Developer shall provide, free of charge, technical support and downloads of all software updates for one year after Substantial Completion and Commissioning.

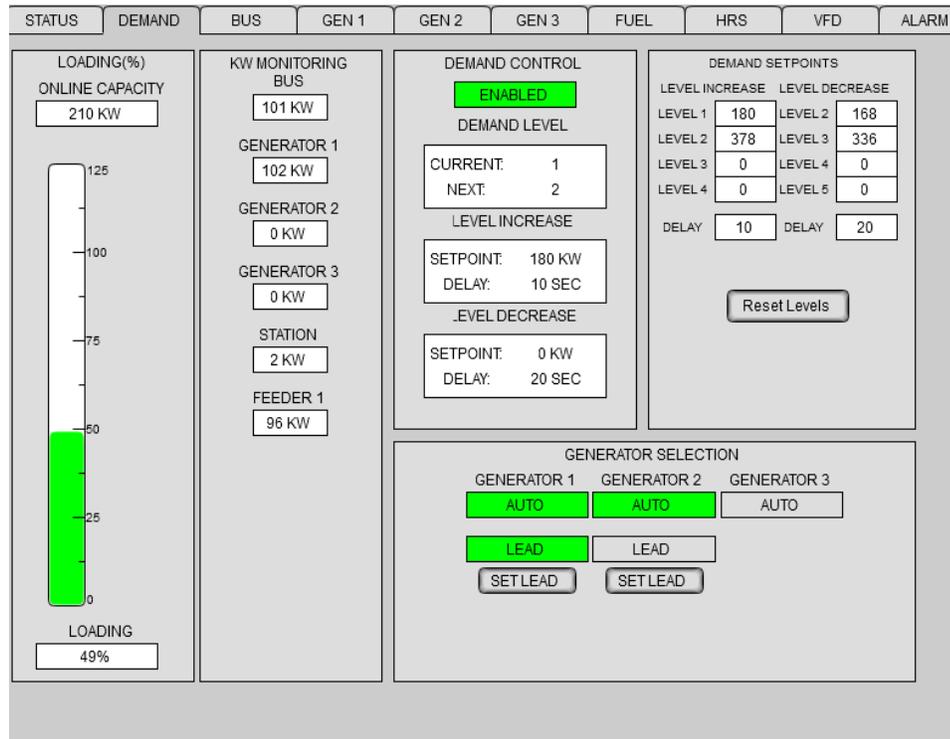
#### **3.4 OIU SCREEN IMAGES**

The SCADA system screens shall display all data as specified in 26 23 00 - Prime Power Switchgear r. At a minimum, the Developer shall provide screens similar to the images shown in following paragraphs. The screen images are representative of the minimum data required and desired format. Each screen image shall be provided for the following devices: Master Section OIU, local PC's connected to the LAN, and remote PC's connected via the internet.

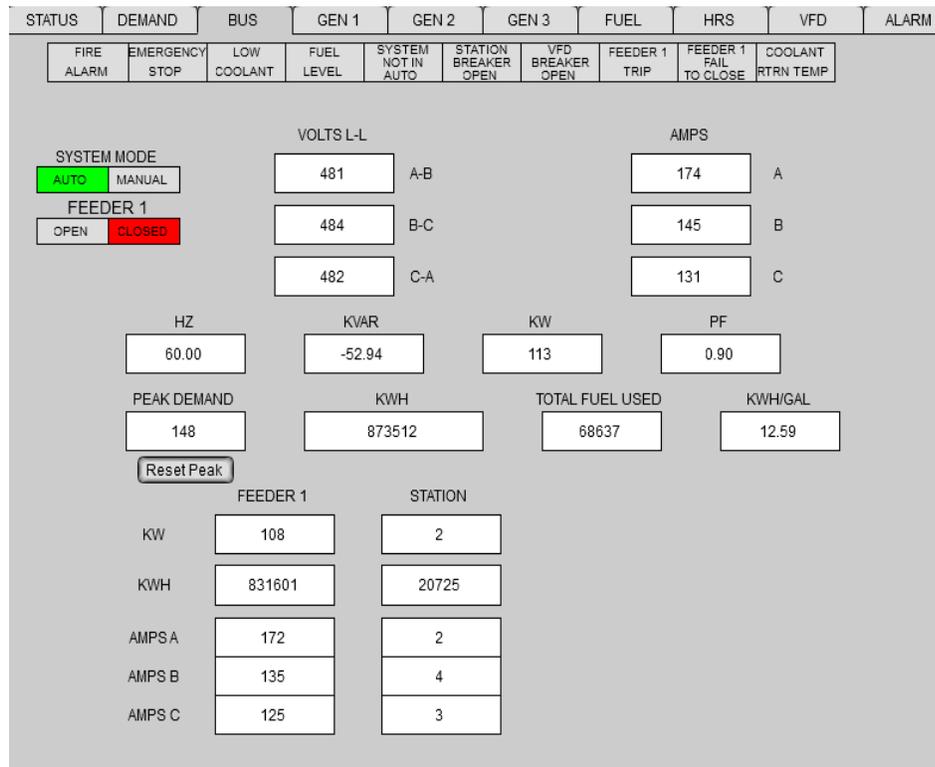
A. Home Screen – Overall Plant Status:



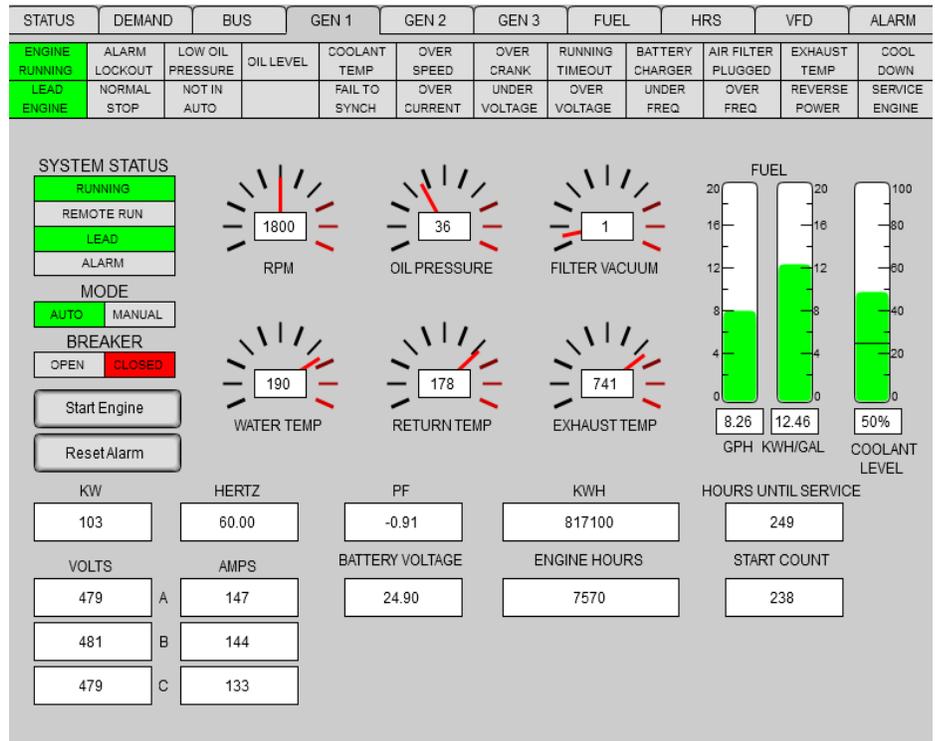
B. Demand Control Screen:



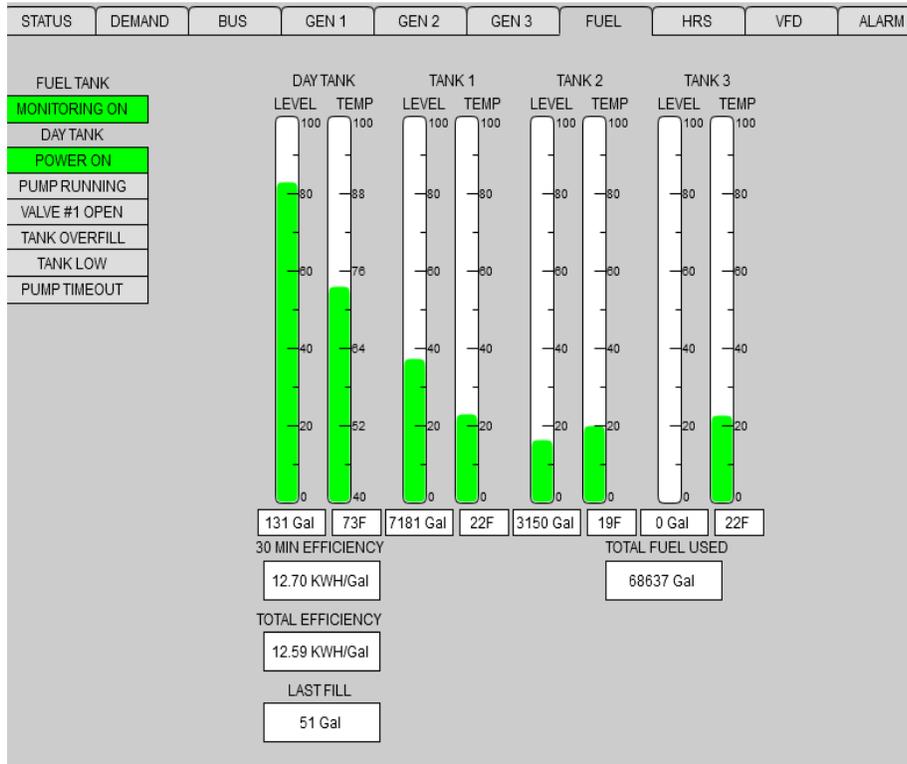
C. Bus Monitoring & Metering Screen:



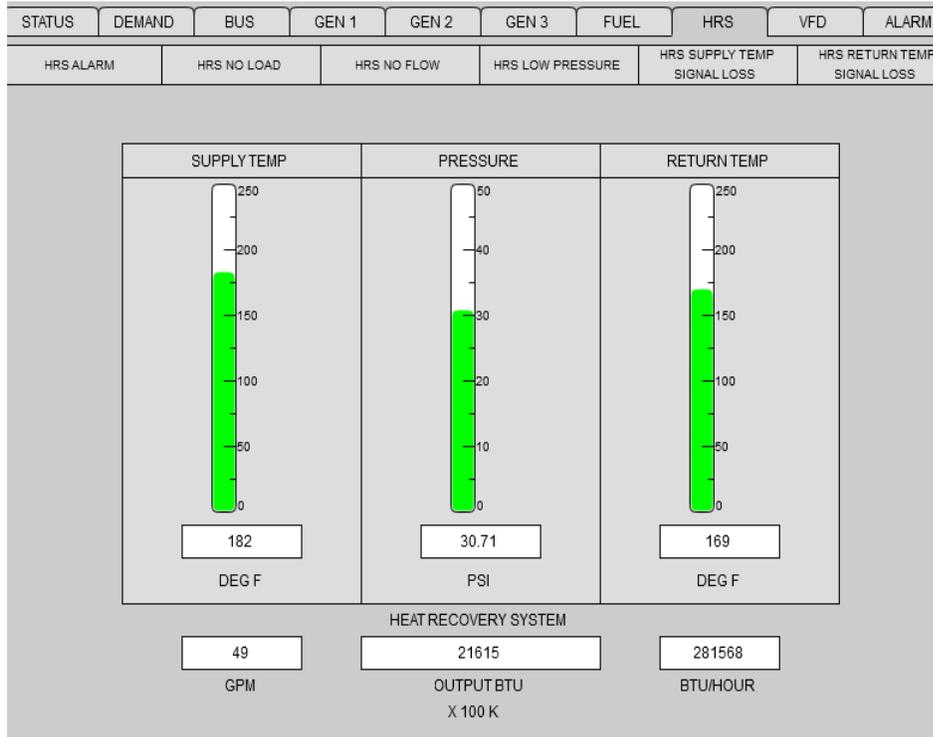
D. Engine-Generator Screen (1 for each genset, 3 total):



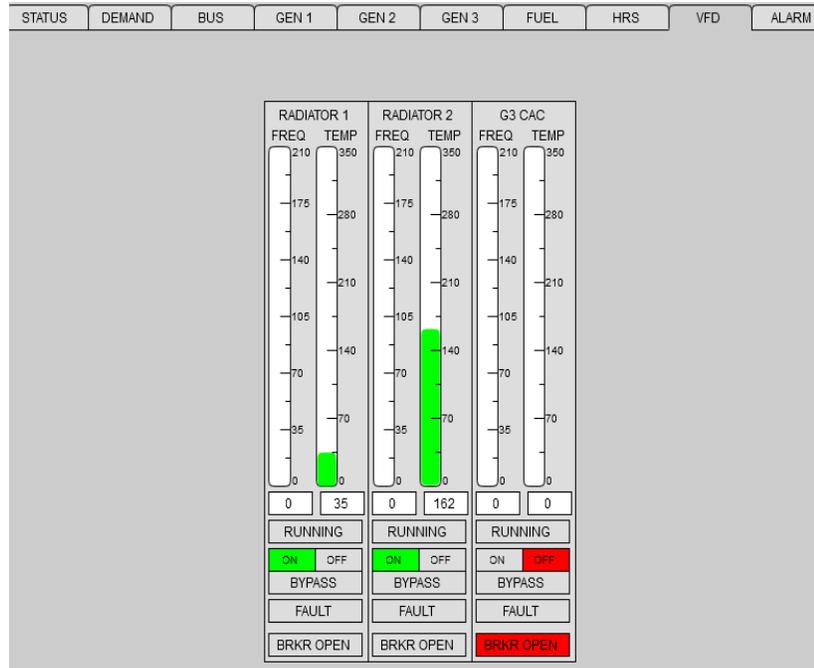
E. Fuel System Monitoring & Alarm Screen:



F. Heat Recovery Monitoring & Metering Screen:



G. Variable Frequency Drive (VFD) Monitoring Screen:



H. Alarm History Screens:

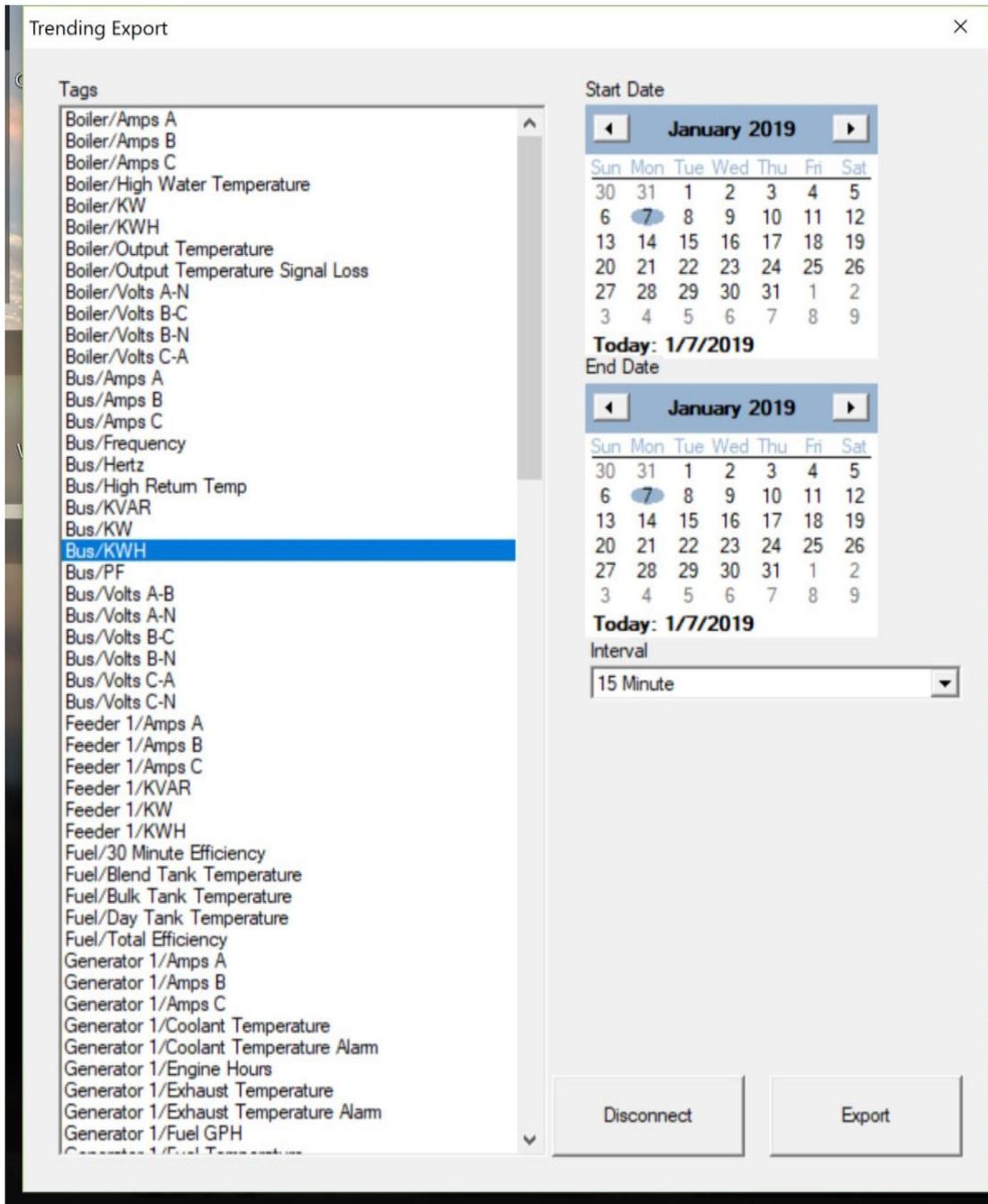
Provide two separate Alarm History Screens, one for Type 1 Soft Shutdown alarms and a second screen for Master Section, Type 2 and Type 3 Alarms. The Type 1 Alarm screen shall use alternating yellow and white lines, as indicated below. The second screen shall use alternating red and white lines.

ALARM NAME	START TIME	STOP TIME
Generator 2/General Alarm	09:04:06 04/27/18	09:18:31 04/27/18
Generator 1/Oil Level Alarm	08:39:02 04/27/18	08:56:41 04/27/18
Generator 1/General Alarm	08:35:21 04/27/18	08:56:41 04/27/18
Generator 1/Oil Level Alarm	19:34:23 04/17/18	19:52:16 04/17/18
Generator 1/General Alarm	19:29:28 04/17/18	19:52:16 04/17/18
Generator 1/Oil Level Alarm	20:00:09 04/08/18	20:20:40 04/08/18
Generator 1/General Alarm	19:56:39 04/08/18	20:20:37 04/08/18
Generator 1/Oil Level Alarm	09:01:16 03/30/18	09:12:19 03/30/18
Generator 1/General Alarm	08:57:22 03/30/18	09:12:19 03/30/18
Generator 1/Oil Level Alarm	09:22:51 03/21/18	09:34:24 03/21/18
Generator 1/Service Engine Alarm	07:24:53 03/21/18	09:34:24 03/21/18
Generator 1/General Alarm	07:24:53 03/21/18	09:34:24 03/21/18
Generator 1/Oil Level Alarm	22:50:57 03/12/18	23:18:44 03/12/18
Generator 1/Service Engine Alarm	05:32:33 03/12/18	23:24:33 03/12/18
Generator 1/General Alarm	05:32:30 03/12/18	23:24:33 03/12/18

◀ 6/6 ▶

### 3.5 TRENDING APPLICATION TAGS

The following Trending Export screens show a representative example of historical data to be archived and available for trending:



Trending Export

Tags

- Generator 1/Fuel GPH
- Generator 1/Fuel Temperature
- Generator 1/Hertz
- Generator 1/KW
- Generator 1/KW Rating
- Generator 1/KWH
- Generator 1/Oil Pressure
- Generator 1/Oil Pressure Alarm
- Generator 1/Oil Temperature Alarm
- Generator 1/RPM
- Generator 1/Volts A-B
- Generator 1/Volts B-C
- Generator 1/Volts C-A
- Generator 2/Amps A
- Generator 2/Amps B
- Generator 2/Amps C
- Generator 2/Coolant Temperature
- Generator 2/Coolant Temperature Alarm
- Generator 2/Engine Hours
- Generator 2/Exhaust Temperature
- Generator 2/Exhaust Temperature Alarm
- Generator 2/Fuel GPH
- Generator 2/Fuel Temperature
- Generator 2/Hertz
- Generator 2/KW
- Generator 2/KW Rating
- Generator 2/KWH
- Generator 2/Oil Pressure
- Generator 2/Oil Pressure Alarm
- Generator 2/Oil Temperature Alarm
- Generator 2/RPM
- Generator 2/Volts A-B
- Generator 2/Volts B-C
- Generator 2/Volts C-A
- Generator 3/Amps A
- Generator 3/Amps B
- Generator 3/Amps C
- Generator 3/Coolant Temperature
- Generator 3/Coolant Temperature Alarm
- Generator 3/Engine Hours
- Generator 3/Exhaust Temperature
- Generator 3/Exhaust Temperature Alarm
- Generator 3/Fuel GPH
- Generator 3/Fuel Temperature
- Generator 3/Hertz
- Generator 3/KW
- Generator 3/KW Rating
- Generator 3/KWH
- Generator 3/Oil Pressure

Start Date

January 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Today: 1/7/2019

End Date

January 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Today: 1/7/2019

Interval

15 Minute

Disconnect Export

Trending Export

Tags

- Generator 3/Fuel Temperature
- Generator 3/Hertz
- Generator 3/KW
- Generator 3/KW Rating
- Generator 3/KWH
- Generator 3/Oil Pressure
- Generator 3/Oil Pressure Alarm
- Generator 3/Oil Temperature Alarm
- Generator 3/RPM
- Generator 3/Volts A-B
- Generator 3/Volts B-C
- Generator 3/Volts C-A
- HRS/BTU Hour
- HRS/Coolant Return Temp
- HRS/Pressure
- HRS/Return Temp
- HRS/Return Temp Signal Fail
- HRS/Total BTU
- Radiator 1 VFD/Frequency
- Radiator 1 VFD/Temperature
- Radiator 2 VFD/Frequency
- Radiator 2 VFD/Temperature
- Station Service/Amps A
- Station Service/Amps B
- Station Service/Amps C
- Station Service/Frequency
- Station Service/KVAR
- Station Service/KW
- Station Service/KWH
- Station Service/Volts A-B
- Station Service/Volts A-N
- Station Service/Volts B-C
- Station Service/Volts B-N
- Station Service/Volts C-A
- Station/Outside Temp
- Wind 1/Amps A
- Wind 1/Amps B
- Wind 1/Amps C
- Wind 1/Frequency
- Wind 1/KVAR
- Wind 1/KW
- Wind 1/KWH
- Wind 1/Volts A-B
- Wind 1/Volts A-N
- Wind 1/Volts B-C
- Wind 1/Volts B-N
- Wind 1/Volts C-A
- Wind 1/Volts C-N

Start Date

January 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Today: 1/7/2019

End Date

January 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Today: 1/7/2019

Interval

15 Minute

Disconnect Export

END OF SECTION

**SECTION 26 32 13  
ENGINE GENERATORS**

**PART 1 - GENERAL**

**1.1 SCOPE**

- A. The Work included herein shall consist of providing, fabricating, and factory testing complete engine generators as specified herein.
- B. The engine generators shall be delivered complete and ready for installation.
- C. Provide all accessories as specified for all engine generators plus any additional components listed.

**1.2 RELATED REQUIREMENTS**

- A. Division 23 Mechanical
- B. Section 26 05 00 Common Work Results for Electrical
- C. Section 26 05 02 Basic Electrical Materials and Methods
- D. Section 26 05 33 Raceway and Boxes for Electrical Systems

**1.3 SUBMITTALS**

- A. Provide in accordance with Section 26 05 00 Common Work Results for Electrical and Division 1.
- B. Provide complete and accurate drawings of the equipment, including outline drawings and dimensional data which fully describe the height, width, and depth of the equipment; skid construction; schematics; wiring diagrams; and other relevant details.
- C. Provide mechanical and electrical performance data for the engine and generator.
- D. Provide manufacturer's catalog literature for all accessories and equipment.
- E. A torsional vibration analysis (TVA) has been prepared and accepted for the following engine generator combinations:
  - 1. John Deere 6068AFM85 with Newage/Stamford UCI274G.
  - 2. John Deere 4045AFM85 with Newage/Stamford UCI274E.

For any engine generator combinations not specifically listed above, a TVA shall be provided for the proposed engine generator combination within 14-days of contract award.

**1.4 REGULATORY COMPLIANCE**

The Environmental Protection Agency (EPA) has issued New Source Performance Standards (NSPS) regulations governing use of stationary diesel engines in remote areas of Alaska. The following provision of 40 CFR Subpart IIII applies to this solicitation:

- A. On November 13, 2019, 40 CFR 60.4216 (c) was revised as follows: Manufacturers, owners, and operators of stationary CI ICE that are located in remote areas of Alaska may choose to meet the applicable emission standards

for emergency engines in §§ 60.4202 and 60.4205, and not those for non-emergency engines in §§ 60.4201 and 60.4204, except that for 2014 model year and later nonemergency CI ICE, the owner or operator of any such engine must have that engine certified as meeting at least the Tier 3 PM standards in 40 CFR 89.112 or 40 CFR 1042.101.

In order to comply with EPA emissions requirements and also be compatible with the intended service applications, the diesel engine furnished under this solicitation shall be a new Tier 3 Marine certified engine.

### **1.5 QUALITY ASSURANCE**

- A. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
- B. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practices. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable.
- C. Equipment and components furnished under these specifications shall be in accordance with the requirements of applicable UL, NEC, IEEE, NEMA, and ANSI standards.

### **1.6 FABRICATOR QUALIFICATIONS**

The engine generators shall be furnished, assembled, and tested by a qualified fabricator (Fabricator) who is regularly engaged in the business of providing diesel engine driven generator equipment.

- A. The Fabricator must have staff with extensive experience in packaging diesel engine driven electrical generators. A list of five successful installations that key staff have worked on may be requested by the Authority after the bid opening and prior to award in order to verify Fabricator qualifications. The list must include installation date, description of installation, and a reference contact for each installation.
- B. The Fabricator must maintain a competent service organization that is available for field service calls. A description of the organization including resumes of key personnel may be requested by the Authority after the bid opening and prior to award in order to verify Fabricator qualifications.
- C. The Fabricator must have a fabrication facility with adequate space and appropriate equipment as required to perform the work. The Authority may inspect the Fabricator's shop after the bid opening and prior to award in order to verify Fabricator qualifications.

### **1.7 FABRICATOR WARRANTIES**

- A. The Fabricator shall warrant the work for a period of not less than one-year. The warranty period shall commence upon acceptance by the Authority of field testing and final commissioning of the equipment.

- B. In the event of equipment or component failure during the warranty period, the Fabricator shall repair or replace such defective equipment or components and bear all associated costs. Costs shall include material, parts, and labor. The Fabricator will be allowed to charge for travel and per diem expenses within Alaska related to warranty service at actual cost plus 10%. The Fabricator shall assist the Authority as directed to determine the cause of failure and pursue manufacturer's warranties to the extent necessary to obtain replacement equipment and provide proof of action taken upon request.
- C. Provide a nametag on each piece of equipment that clearly identifies the party responsible for the warranty. Nametag shall include the name, address, and phone number, and shop order or Fabricator's serial number.

### **1.8 OPERATION AND MAINTENANCE MANUALS.**

- A. Provide one (1) complete bound set of operation and maintenance (O&M) manuals for each unique engine generator unit. Identification symbols for all replaceable parts and assemblies shall be included. Provide manuals for the following equipment:
  - 1. Engine.
  - 2. Generator.
  - 3. Voltage Regulator.
  - 4. All accessories.
- B. For each engine provide all available factory service publications including parts manuals, service manuals, component technical manuals, etc.
- C. For all other components of each engine generator unit provide:
  - 1. Equipment function, normal operating characteristics, and limiting conditions.
  - 2. Assembly, installation, alignment, adjustment, and checking instructions.
  - 3. Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
  - 4. Lubrication and maintenance instructions.
  - 5. Guide to "troubleshooting."
  - 6. Parts list.
  - 7. Outline, cross section, elevation, and assembly drawings
  - 8. Engineering data including all mechanical and electrical performance characteristics.
  - 9. Complete AC connection and three-line diagrams.
  - 10. Complete DC schematics including voltage regulator, fuel injector pump, sensors, switches, fuses, and all other devices.
- D. The operation and maintenance manuals shall be in addition to any instructions or parts list packed with or attached to the equipment when delivered, or any information submitted for review.
- E. Each copy of the final O&M manual shall be provided with original copies of the manufacturer's instruction books. Copies of manufacturer's instruction books shall not be inserted in any of the final O&M manuals.

- F. Bind materials in locking three ring “D” style binders. Binder capacities shall not exceed 3 inches, nor shall material included exceed the designed binder capacity. If material to be bound exceeds capacity rating, multiple volumes shall be furnished. Binder capacity shall not be less than approximately 1/2 inch greater than the thickness of the material within the binder. Permanently label with project information on the front cover and edge.
- G. Where reduction is not practical, larger drawings shall be folded separately and placed in envelopes, which are bound into the manuals. Each envelope shall bear suitable identification on the outside.
- H. All information in the O&M manuals shall be new and original publications.
- I. All as-built drawings shall be provided in Adobe PDF format on CD.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL CONFIGURATION AND MANUFACTURERS**

- A. All units shall be complete skid mounted engine generators utilizing all new components.
- B. All units shall be configured as specified herein and shall include all accessories as indicated.
- C. Engines shall be rated for prime power duty at the horsepower (shaft) and electrical kilowatt (generator) ratings indicated for each unit. All engines shall be 1800 RPM unless specifically indicated otherwise. All starting and control systems shall be 24 VDC.
- D. Provide engines of the manufacturer and model as indicated in Paragraph 2.2 - Specific Configuration, no other substitutes except as specifically noted below.
- E. Approved equal substitutions of engines will be allowed only by Engineer's approval. To obtain approval, submittals must clearly demonstrate the following:
  - 1. The substitute engine must meet all of the requirements of Paragraph 2.3
  - 2. The substitute engine manufacturer must have at least one factory authorized service representative with a permanent shop in Southcentral Alaska.
  - 3. The size and weight of the substitute engine must not exceed that of the specified engine by more than 10%.
  - 4. The physical layout, piping connections, and service access areas of the substitute engine must be sufficiently similar to that of the specified engine so that no major changes will be required to the power plant design.
  - 5. The substitute engine must meet or exceed the fuel efficiency rate of the specified engine. Provide fuel curve showing fuel consumption (kWh/gallon) at 25%, 50%, 75% and 100% of prime rated capacity.
  - 6. The substitute engine must be provided with a single jacket water cooling circuit without a separate aftercooler circuit.

7. The substitute engine must meet or exceed the heat rejection to the jacket water circuit of the specified engine.
  8. The engine must not be equipped, or require to be equipped, with any exhaust emissions equipment including Exhaust Gas Recirculation, Diesel Oxidation Catalyst, Diesel Particulate Filter, or Selective Catalytic Reduction.
- F. Provide Newage/Stamford generators as indicated in the Specific Configuration requirements that follow or Kato equal, no other substitutes except as specifically noted below. The generator shall be rated for continuous output at the value and temperature rise indicated at 0.8 power factor. The generator shall be 2/3 pitch winding, 3 phase, 277/480 volt, 12 lead reconnectable, with PMG excitation.
- G. If a Marathon or other generator of equivalent or greater capacity is provided it shall be modified and upgraded prior to installation. Upon receipt of the generator from the factory it shall be taken to a manufacturer's authorized warranty service shop and the following tasks shall be performed:
1. Remove rotor assembly, bearing, exciter, diode plate and inspect for defects.
  2. If any defects are encountered immediately file a warranty claim with the manufacturer.
  3. Electrically test all windings.
  4. Encapsulate exciter rotor winding with epoxy.
  5. Replace bearing prior to reinstalling exciter. Bearing shall meet the minimum requirements of these specifications.
  6. Replace diode plate mounting bolts with grade 8 bolts and use Loctite.
  7. Insulate main rotor leads with phase paper. Secure leads with heat shrinkable polyester tape using epoxy on all knots.
  8. Spray coat all windings with epoxy.
  9. Dynamically balance and re-assemble.
  10. Test at rated RPM.

## 2.2 SPECIFIC CONFIGURATION

A. Nikolai Engine Generators shall be as follows:

**No. 1: Engine** - 223 hp, 150 ekW prime, John Deere 6068AFM85, Tier 3 Marine.  
Starting and Control Voltage = 24 VDC (convert as required).

**Generator** - Minimum 170kW continuous at 105°C rise, Newage/Stamford UCI274G or Kato equal.

**No. 2: Engine** - 148 hp, 100 ekW prime, John Deere 4045AFM85, Tier 3 Marine.  
Starting and Control Voltage = 24 VDC (convert as required).

**Generator** - Minimum 125kW continuous at 105°C rise, Newage/Stamford UCI274E or Kato equal.

**No. 3: Engine** - 148 hp, 100 ekW prime, John Deere 4045AFM85, Tier 3 Marine.  
Starting and Control Voltage = 24 VDC (convert as required).

**Generator** - Minimum 125kW continuous at 105°C rise, Newage/Stamford UCI274E or Kato equal.

B. Venetie Engine Generators shall be as follows:

**No. 1: Engine** - 148 hp, 100 ekW prime, John Deere 4045AFM85, Tier 3 Marine. Starting and Control Voltage = 24 VDC (convert as required).

**Generator** - Minimum 125kW continuous at 105°C rise, Newage/Stamford UCI274E or Kato equal.

**No. 2: Engine** - 319 hp, 225 ekW prime, John Deere 6090HFM85, Tier 3 Marine. Starting and Control Voltage = 24 VDC.

**Generator** - Minimum 270kW continuous at 105°C rise, Newage/Stamford S4L1D-D41 or Kato equal.

**No. 3: Engine** - 319 hp, 225 ekW prime, John Deere 6090HFM85, Tier 3 Marine. Starting and Control Voltage = 24 VDC.

**Generator** - Minimum 270kW continuous at 105°C rise, Newage/Stamford S4L1D-D41 or Kato equal.

## 2.3 ENGINE

- A. Provide a skid mounted, 1800 RPM, diesel engine complete with generator/alternator and ready for service. The unit shall be of newest design and of recent manufacture.
- B. Marine engines shall be furnished without a charging alternator, heat exchanger, coolant expansion tank, or accessory reduction gear drive. Factory installed components shall be removed as required.
- C. The engine shall be a four-cycle, water-cooled, direct injection diesel engine of 4 or 6 cylinder in-line configuration as indicated by model number and shall be provided with a gear driven coolant pump where offered by manufacturer.
- D. Cylinder Liners: The engines shall be provided with removable cylinder liners to facilitate field rebuilding.
- E. Horsepower: Certified engine power curves and fuel consumption at 25%, 50%, 75%, and 100% loading, shall be submitted showing the manufacturer's approval of the engine rating for engine generator prime power application. Special ratings or "continuous standby" ratings will not be acceptable.
- F. Engine Control: All engine control functions will be performed by remote switchgear which will perform all start/stop, speed, paralleling, and load sharing control functions in addition to all engine function monitoring and safety shut downs. Engine manufacturer's electronic control panels shall not be provided.
- G. ECU and Isochronous Governor: Provide an Engine Control Unit (ECU) for interface with the switchgear. Program the ECU for nominal 1800 RPM operation at 2.5 VDC input, variable RPM above and below 2.5 VDC input, and idle operation at input less than or equal to 0.5 VDC.
- H. ECU Mounting: When available from the engine manufacturer, provide an ECU mounting panel for installation of the ECU and accessories. Mount in a readily accessible location adjacent to the engine control wiring junction box as shown on

the Drawings. The terminals in the engine control wiring junction box connection shall be connected to the ECU mounting panel using manufacturer's standard connectors.

- I. Fuel: The engine shall be capable of satisfactory performance on No. 1 or No. 2 Ultra Low Sulphur Diesel (ULSD) Fuel.
- J. Fuel System: The engine shall have manufacturer's engine mounted fuel filters with replaceable elements. Fuel supply and return lines shall be routed to the front of generator skid for field connection to the plant piping. See Drawings for detailed configuration.
- K. Lubrication: The engine shall have a gear type lubricating oil pump for supplying oil under pressure to the main bearings, crankshaft bearings, pistons, piston pins, timing gears, camshaft bearings and valve rocker mechanism. Threaded spin-on type, full flow lubricating oil filters shall be provided. The oil drain line shall be routed to the front of generator skid for field connection to the plant piping. See Drawings for detailed configuration.
- L. Oil Level: The engine shall have a combination visual oil level site gauge with adjustable high and low level switches, Murphy L129CK1 or approved equal. Mount on rubber isolators and connect to engine with minimum #8 hoses. Carefully route upper vent hose to create a high point and connect directly into crankcase. Route lower hose to a connection directly on the oil pan. Do not tee lower hose into oil drain line. See Drawings for installation detail.
- M. Fuel and Oil Hoses: All hoses for fuel, lube oil, vents, mechanical gauges, etc., shall be Aeroquip type FC300, Eaton Weatherhead H569 or approved equal. Minimum hose size shall be 5/16" (#6). Provide with re-useable JIC swivel type fittings. Push-on or barb type hose connections will not be allowed. Route hoses to avoid wear points and to ensure access to normal service points on the engine. Securely support hoses from engine and skid.
- N. Glycol Hoses: All hoses for glycol shall be Teflon hose with stainless steel outer braid, Eaton Weatherhead H243 or approved equal. Provide with re-useable plated steel straight JIC swivel ends with NPT adapters. Route hoses to avoid wear points and to ensure access to normal service points on the engine. Securely support hoses from engine and skid.
- O. Wire Loom: All wiring for control and instrumentation shall be routed in plastic loom. Provide tee fittings for all branch connections. Route loom to avoid wear points and to ensure access to normal service points on the engine. Securely support loom from engine and skid.
- P. Protective Guards: All moving parts and hot surfaces shall be provided with protective guards in accordance with U.L Standard 2200.
- Q. Air Cleaners: The engine shall be provided with a dry-type, replaceable element air cleaner with a metal canister, Donaldson or approved equal. Open disposable type air filters or plastic canisters will not be accepted. Provide visual air restriction indicator, 20" water column limit, manual reset, Donaldson X002251 or approved equal.

- R. Starting: The engine shall be equipped with a 24 VDC electric starting system. The starting system shall be of sufficient capacity to crank the engine at a speed which will allow full diesel starting. A starter auxiliary relay shall be remote mounted in control wiring junction box:
1. 24 VDC Auxiliary Relay: Caterpillar 9X-8124, John Deere AT145341 or Denso equal.
- S. Control Power: To provide 24VDC power to the control wiring junction box, a 30A circuit breaker with switch shall be mounted on the engine in the vicinity of the starter, Cooper 187-030-F-00 or approved equal.
- T. Sensors and Safety Controls: The engine shall be equipped with the following:
1. Exhaust Gas Temperature. High temperature (650°C) 2 wire 100 ohm RTD with 2' high temperature lead wire, spring strain relief, Deutz DT06-2S-E008 male connector, Deutz DT04-2P-E008 female connector, and compression fitting with 1/4" MPT adapter. Eustis RGB7B203B02X0 with NS44 adapter or approved equal. See note 2 below.
  2. Air Filter Vacuum Sensor. 4-20mA, -30"Hg to 0 PSIG, 1/4" MPT. Noshok 100-30V-1-1-2-7 or approved equal.
  3. Intake Air Temperature Sensor. 4-20mA, 20-240°F, 1/2" MPT. Noshok 800-20/240-1-1-8-8-025-6 or approved equal. Note that this is only installed on units with charge air coolers as indicated in the prior Specific Configuration requirements. See note 3 below for installation.
- Note 1. The above listed sensors shall be independent from engine gauges and all other devices and sensors. Where standard factory furnished sensors for the above listed functions are required for operation of the ECU, provide additional duplicate sensors as specified. All sensors shall be installed on the engine and wired to terminal blocks as indicated in the Drawings.
- Note 2. Upon completion of shop testing, if exhaust gas temperature sensor is installed in flex remove sensor and tywrap to engine in a secure location for shipping.
- Note 3. Intake air gas temperature sensor will be field installed in charge air tubing off the engine. Provide min 6' service loop of wire in loom for field routing and termination. Tywrap sensor to engine in a secure location for shipping.
- U. Safety Controls: The automatic switchgear provided by others shall be equipped with automatic safety controls which will shut down the engine in the event of high jacket water temperature (primary), high lubricating oil temperature, low lubricating oil pressure, high or low lubricating oil level, high air filter vacuum, and engine overspeed based on J1939 CANbus and engine mounted sensors. Note that a single low water shut down switch will be installed on the external cooling system.

## 2.4 EXHAUST FLEX

- A. A flexible, continuous, 18 inch long stainless steel exhaust flex connector with welded connections shall be furnished for each engine, Alaska Rubber or approved equal. Provide an appropriate engine mating connection at one end and an ASA 125 lb. flange sized to match silencer at the opposite end. Slotted cuff connections are not acceptable. Provide gasket, bolts, v-clamp, or any other components required for connection to the engine. Provide a 90° elbow where required for the flex to be installed vertically. Note that if the exhaust temperature sensor cannot be installed directly in the outlet connection, a 1/4" FPT stainless steel thread-o-let shall be welded into the flex between the engine connection and the corrugated hose.

## 2.5 ACCESSORIES

Provide the following accessories for each engine generator (unless otherwise indicated):

- A. Spring vibration isolators complete with mounting hardware, four (4) per each unit, sized for the complete engine generator unit weight. Caldyn Type RJ or approved equal.
- B. Drip pan, 16-gauge galvanized sheet metal, liquid tight joints, 20" wide by 50" long by 1" high.
- C. Minimum 800 cold crank amp 12-volt starting batteries, two for each engine. Batteries shall be sealed maintenance free, Optima Red Top NAPA Part Number BAT N993478RED or approved equal. Furnish and install battery racks sized to hold the batteries with hardware to secure the battery for shipping.
- D. Each engine shall be provided with two each #2/0 AWG arctic flex battery cables, length as required, plus one each #2/0 AWG by 12-inch long jumper. All cables shall include compression type terminal ends shipped loose. One battery cable shall be red for the positive lead and the other shall be black for the negative lead. The jumper shall be black with red heat shrink one end. Provide plastic terminal covers. The battery cables shall be routed and supported as indicated on the Drawings.

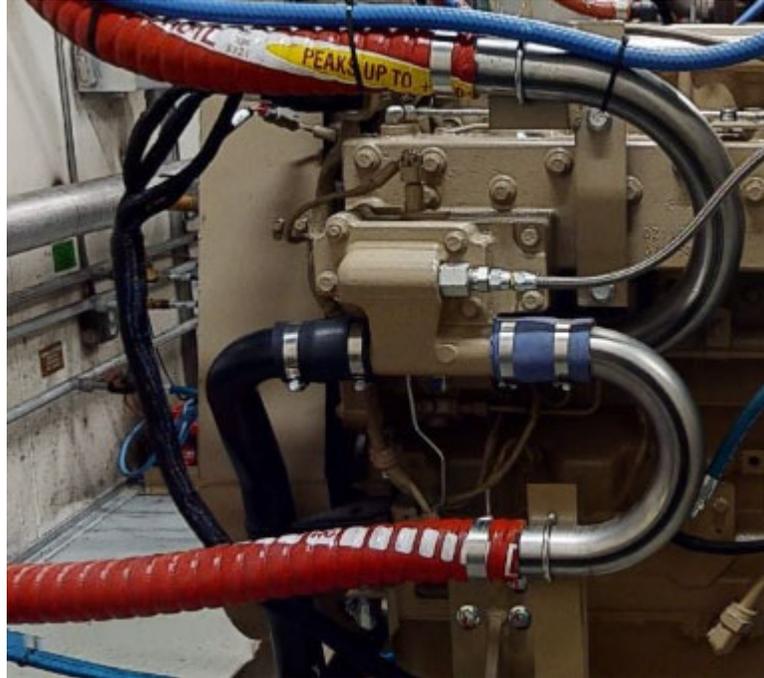
## 2.6 COOLING SYSTEM

- A. Engine cooling shall be by remote radiators (provided by others) with coolant circulation driven by the engine coolant pump.
- B. Glycol Filter: Provide screw-on canister style filter element with 3/8" NPT connections on head, Wix #24019 head with #24069 element or approved equal. Mount head on steel bracket fixed to front or side of engine. Connect to engine with glycol hoses with 3/8" NPT quarter turn gauge cock isolation valves. Connect inlet to thermostat housing and connect outlet to water pump inlet. On thermostat housing connection provide 3/8" NPT tee fitting with plug for field connection of pre-heat line by others. When filters are provided as part of engine manufacturer's assembly the standard factory filters may be substituted for the above specified parts; however, equivalent mounting, connections, and isolation valves shall be included.
- C. Modify marine engines as follows:

1. John Deere 4045AFM - Remove coolant tank and other accessories that are not required. Note that the 4045AFM85 engines have small ports in the coolant hose connection fittings that are overly restrictive. To provide adequate flow for prime power application remove the coolant discharge and suction connection fittings. Cut off hose ends and drill or bore out a 2.5 inch diameter hole. Furnish new 2 inch aluminum king nipples, cut off threads, and weld to housings. Reinstall connection fittings with discharge oriented vertically and suction oriented horizontally. Install a bent or welded section of 2 inch steel tube routed to the front of the left skid and supported from the skid. Provide hose barbs on each end and connect to engine suction fitting with short section of silicone hose as required. See photographs for representative installation.



2. 6068AFM - Remove coolant tank and other accessories that are not required. Modify coolant discharge and suction connections to face horizontally at the front of the engine using bent steel tubing and short sections of silicone hose. Support steel tube from skid and engine. See photograph below for representative installation.



3. 6090HFM - Remove coolant tank and other accessories that are not required. Manifold vent lines into a single connection near the front with a 3/8" NPT quarter turn gauge cock isolation valve.

## 2.7 INSTRUMENT PANEL

- A. Provide a J1939 multi-function monitoring panel, Murphy PV101-C or approved equal. Note that panel must be furnished with **non-Tier 4 firmware**, no exceptions. The panel shall be mounted on the side of the control wiring junction box. Provide with wiring harness as required for connection to ECU and battery power.

## 2.8 GENERATOR/ALTERNATOR

- A. Generator shall be a single bearing, four pole, synchronous type. Generator shall be directly connected to the engine flywheel housing and driven through a flexible coupling to ensure permanent alignment. The generator shall be rated three phase, 277/480V, 60 Hz, 1800 RPM, brushless, 12 lead reconnectable, and winding pitch of 2/3 design. Windings shall be random wound and lashed at the end turns to provide superior mechanical strength.
- B. The rotating assembly shall be dynamically balanced to less than 2 mils peak to peak displacement and shall be designed to have an over speed withstand of 125% of rated speed for 2 minutes in accordance with NEMA MG1-32.
- C. Cast iron end brackets with bearing bores machined for an O-Ring to retard bearing outer race rotation and fabricated steel frames shall be used. Bearings

shall be pre-lubricated, double shielded, ball type, single row Conrad, C3 fit. Minimum B-10 bearing life shall be 30,000 hours for single bearing units.

- D. Generator wiring diagram shall be permanently installed on the inside of the terminal enclosure cover.
- E. The insulation system of both the rotor and stator shall be of NEMA Class H materials or better and shall be synthetic and non-hygroscopic. The stator winding and rotor shall be coated with resin plus an epoxy sealant for extra moisture and abrasion resistance.
- F. The generator shall be equipped with a permanent magnet generator (PMG) excitation system. The system shall supply a minimum short circuit support current of 300% of the rating for 10 seconds. The rotating exciter shall use a three-phase full wave rectifier assembly with hermetically sealed silicon diodes protected against abnormal transient conditions by a multi-plate selenium surge protector. The diodes shall be designed for safety factors of 5 times voltage and 1.5 times current.
- G. Voltage Regulator: The voltage regulator shall be compatible with the PMG excitation and shall control the output of the brushless AC generator by regulating the current into the exciter field. The regulator shall include an autotuning feature with two PID stability groups. The voltage regulation shall be minimum 0.25% accuracy. Basler DECS-150 5NS1V1N1S or approved equal.
  - 1. The voltage regulator shall be configured for rear mounting and shall be mounted inside of the control wiring junction box as indicated in the Drawings.
  - 2. The voltage regulator shall be connected to the 3 phase voltage sensing, field, and PMG on terminal blocks in the control wiring junction box as indicated in the Drawings.
- H. Nameplate: On the side of the generator housing, provide a nameplate that provides the following information. The nameplate shall be located in a clearly visible location and shall not be obscured by the terminal enclosure or located such that the nameplate is behind any part of the generator or housing.
  - 1. Rated kW as specified.
  - 2. Full load amps.
  - 3. Rated voltage, phase, and power factor.
  - 4. Rated voltage and current of the field exciter.
- I. Each generator shall be provided with a standard sized terminal compartment. The terminal compartment shall be provided with a load connection block to allow easy field termination of the load, neutral, and ground conductors. The generator neutral connection shall not be connected to the mounting skid or the generator frame. The neutral shall be isolated for field grounding by others at the switchgear or transformer.
- J. The generator shall be self-ventilated with a direct drive one-piece, cast aluminum alloy, unidirectional internal fan for high volume, low noise air delivery. Airflow

shall be from opposite drive end through generator to drive end. The exciter shall be in the airflow.

- K. Replace the standard factory hardware used for attachment of the generator coupling disc to the engine flywheel with Grade 8 hex head bolts. Install heavy gauge washers, tighten and torque bolts in accordance with manufacturer's specifications, and paint pen mark after final torquing.

## 2.9 MOUNTING SKID

- A. The engine generator shall be equipped with a suitable full length base frame (skid) for mounting the engine and generator. The skid shall be constructed from structural steel channel with ends beveled and plated for short term skidding and rolling of unit. **No formed or stamped steel base frame designs will be accepted.** Provisions shall be made so that the generator can slide back a minimum of 12" to access the rear main seal on the engine without removing the generator end off of the skid or requiring the use of blocking to support it. See the Drawings for skid design and layout.
- B. Provisions shall be made in the skid for the mounting of vibration isolators at locations as indicated on the Drawings. Wedge washers shall be welded in place on the skid to provide a flat surface for the vibration isolator lock nuts.
- C. Each engine generator shall be placed on the skid at the location indicated on the Drawings.

## 2.10 WIRING INTERFACE WITH REMOTE SWITCHGEAR

- A. A control wiring junction box shall be furnished for each generator as follows:
  - 1. The junction box shall be steel, NEMA 12, with hinged door and screw down latches. B-Line, Hoffman or approved equal. See Drawings for size.
  - 2. The junction box orientation, device layout, terminal block layout, and labeling shall be as indicated on the Drawings.
  - 3. Install the voltage regulator and the instrument panel as previously specified in the junction box as shown on the Drawings.
  - 4. All wiring for control, monitoring, and safety shall be terminated on terminal blocks within the control wiring junction. The terminals shall be IDEC or approved equal, BNH15LW except where indicated 50A provide BNH50W. Terminals shall be mounted on DIN rail with heavy duty end anchors. Each terminal block and all wire terminations shall be individually numbered as indicated.
  - 5. The generator control wiring shall be provided with a maintenance loop of sufficient length to allow the generator to be slid back 12" minimum for maintenance of the engine without being disconnected.
  - 6. The engine control wiring shall be connected to the ECU mounting panel using manufacturer's standard connectors.

- B. The DC power supply for the switchgear shall be provided from the engine starting batteries through the engine-mounted circuit breaker. Terminals shall be provided as indicated on the Drawings for supplying 24 VDC to the switchgear. All remote indication will be 24VDC, 4-20mA, or as otherwise indicated. All switches used for remote indication shall be rated for operation at 24 VDC.
- C. Label each control wiring junction box with the serial number of the associated engine. Connect to the engine and generator prior to performing the load test.

## **2.11 PAINTING**

Each unit shall be painted John Deere green including engine, skid, and generator.

## **2.12 SPARE FILTERS**

In addition to the filters installed on the engines, provide the following quantities of replacement filters for each engine plus break in oil. Package spare filters and oil in boxes and label each box with the engine model and the community name.

- A. Twelve (12) oil filters.
- B. Four (4) fuel filters.
- C. Three (3) air filters
- D. Four (4) glycol filters.
- E. Break in oil identical to oil installed in engine. One (1) gallon for each engine.

## **PART 3 - EXECUTION**

### **3.1 FACTORY TESTS**

- A. Prior to shipment, the engine generator Fabricator shall perform factory tests on each unit at the shop where the engine generator is assembled. Supply sufficient notice to the Authority prior to performing tests. The Authority reserves the right to witness all tests. Test procedures shall conform to ASME, IEEE, and ANSI standards, and NEMA standard practices section on testing, as appropriate and applicable.
- B. The Fabricator shall provide all required mechanical and electrical equipment including but not limited to fuel supply, radiator, charge air cooler, exhaust, load bank, etc. as required.
- C. The Fabricator shall provide all required measuring and indicating devices. All devices shall be certified correct or correction data furnished for the device.
- D. Prior to performing the load test, the engine generator Fabricator shall perform the following:
  - 1. Verify that engine is filled with break in oil. The break in oil shall be approved by the engine manufacturer for 100 to 500 hour run time, John Deere Break-In Plus or approved equal. Pull a sample of the clean lube oil prior to the load test to be used for reference.
  - 2. Perform hydrostatic test on water jackets to ensure that water seals and water jackets are watertight. Test report shall indicate pressure at which test was made and the results.
  - 3. Connect engine coolant piping to radiator or heat exchanger. Note that all engine coolant circulation must be performed by the engine water pump without the benefit of any external pump or pressurized system.
  - 4. Install thermometer to monitor coolant return temperature entering the engine for comparison against the coolant discharge temperature.
  - 5. Connect engine air piping to charge air cooler.
  - 6. Connect engine and generator to the associated control wiring junction box.
- E. Engine Tests: Perform customary commercial factory 8 hour load test on each engine generator including, but not limited to, the following:
  - 1. Prior to the 8 hour run, connect the ECU to an analog throttle input and verify that it is correctly responding including idle operation at input less than or equal to 0.5 VDC, 1800 RPM at 2.5 VDC, and variable RPM above and below 2.5 VDC. Note confirmation on the load test.
  - 2. Take a screen shot to document the ECU throttle programming and include with the load test reports for each engine.
  - 3. Place engine in continuous operation without stoppage for a period of not less than eight hours. Operate not less than one hour at each load point (1/2, 3/4, and full load) and 1 hour at 110 percent of rated load. If stoppage becomes necessary during this period, repeat the 8-hour run.

4. Record the following data at the start, at 15-minute intervals, and at the end of each load run: Hz, kW load, fuel consumption, exhaust temperature, intake air temperature, jacket water temperature, coolant return temperature, lube oil temperature, lube oil pressure, manifold (boost) pressure, and crankcase vacuum.
- F. Tests shall indicate satisfactory operation and attainment of guarantees and specified performance. Provide test reports including certified copies of all Fabricators' test data and results. Include laboratory analysis for the clean lube oil sample and the sample pulled after the test. Contractor shall not install engine-generators in the power plant without approval by the Authority of the shop test reports.

### **3.2 SHIPPING**

- A. Upon completion of testing perform the following steps to prepare for shipping:
1. Flush the cooling system with extended life 50/50 ethylene glycol mix, Shell Rotella ELC or approved equal. Install covers over the connections. Note that if testing was performed with extended life ethylene glycol solution the engine does not need to be flushed.
  2. Pull a sample of the lube oil. Send to a laboratory for analysis. Include the sample of clean lube oil pulled prior to the load test for reference comparison.
  3. Remove oil filter, split case, inspect contents and take photo to document. Note that if metal fragments are found contact the Authority immediately.
  4. Remove any dirt from the air cleaner; check all seals and gaskets. Put lubricant on all points given in the lubrication chart of the engine operation guide.
  5. Turn the engine at cranking speed with throttle control in full off position and use a sprayer to add a mixture of 50% VCI (volatile corrosion inhibitor) oil and 50% 30 weight oil into the air intake or turbocharger inlet.
  6. Continue spraying the mixture of 50% VCI oil and 50% 30-weight engine oil into the air intake or turbocharger inlet to ensure the cylinders and exhaust ports are coated with the oily mixture.
  7. Clean the outside of the engine and inspect and ensure that the engine and generator are covered by good quality paint. Correct any deficiencies.
  8. Spray a thin amount of 50% VCI oil and 50% 30-weight engine oil on the flywheel, ring gear teeth, and starter pinion. Install the covers to keep the vapors in.
  9. Install a positive mechanical seal consisting of a fitting plate and gasket on exhaust opening. Then install all covers and/or tape on any other openings. Ensure all covers are air tight and weatherproof. Use waterproof, weather resistant type tape. Do not install tape in such a manner as will damage paint when the tape is removed. Install a

mechanical protective device over any protruding items, which may be vulnerable to damage during transportation.

- B. After preparing the equipment for shipping, package each engine generator separately as follows:
  - 1. Coil wiring harnesses and secure control wiring junction box to generator.
  - 2. Put a waterproof cover over the entire engine generator unit. Make the cover tight, but loose enough to let air circulate around the unit to prevent damage to exposed metal parts from condensation.
  - 3. All other included components (spare parts, loose items, etc.) shall be packaged individually in waterproof wrapping. Each individual component package shall then be packed in a box or crate, and each box/crate wrapped in waterproof wrapping to prevent corrosion to the components during extended periods of outside storage. All boxes or crates shall be palletized onto the minimum number of pallets, as required for the quantity and size of the boxes/crates.

### **3.3 INSTALLATION AND COMMISSIONING**

- A. Install the engine generators as indicated on the Drawings.
- B. Adjust spring vibration isolators as indicated on the Drawings.
- C. Ensure correct fit and alignment of all connections to not cause stress on engine connections or wear on piping, hoses, conduit, wiring, etc.
- D. Start each unit in Idle mode and run at idle speed for five minutes minimum then switch to Rated speed. Visually check each engine for noise, vibration, leaks, etc.
- E. During functional testing and commissioning, perform final inspection and testing as required to ensure full authorization of factory warranty.

**END OF SECTION**

**SECTION 27 05 10**  
**COMMUNICATIONS AND DATA SERVICE**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

- A. This section describes specific requirements, products, and methods of execution relating to providing telecommunications and internet data service to the power plant.

**1.2 RELATED REQUIREMENTS:**

- A. Division 26
- B. Division 33

**1.3 AVAILABLE LOCAL DATA AND COMMUNICATION**

- A. Cell phone service is not presently available in either Nikolai or Venetie. United Utilities Inc. (UUI) provides local telephone service via landline and DSL internet service over telephone lines in both communities. Contact UUI 800-478-2020 in advance to arrange for required service.
  - a. UUI telephone is local service only. Other arrangements may need to be made for long distance telephone service.
  - b. The UUI 1Mbps/256Kbps internet service is adequate for permanent basic service to the power plant to support the SCADA system. It may not be adequate for Contractor needs. Other arrangements may need to be made for streaming service.

**1.4 TEMPORARY CONSTRUCTION DATA AND COMMUNICATION**

- A. The Contractor shall acquire and maintain throughout the duration of the Work telephone service for conducting progress meetings and internet service for providing regular progress reporting.

**1.5 PERMANENT DATA AND COMMUNICATION**

- A. Prior to Substantial Completion the Contractor shall provide local telephone and basic internet service at the power plant. The Contractor shall be responsible for furnishing all equipment and accessories required to provide dedicated telephone and internet service to the power plant and shall ensure the equipment is installed correctly and operational.
- B. A new account shall be set up in the Utility name. The contractor shall pre-pay for one year of local telephone and basic internet service. Any long distance charges, data overages, or additional features shall be the responsibility of the Utility.
- C. Basic internet service shall include at a minimum:
  - 1. Public Facing or Static IP Address.
  - 2. Minimum 1.0 MBPS Download
  - 3. Minimum 256 kBPS Upload.
  - 4. 7 GB monthly data limit.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 31 11 00**  
**CLEARING AND GRUBBING**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

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

**1.2 RELATED REQUIREMENTS**

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

**1.3 DEFINITIONS**

- A. Clearing: Includes cutting all brush, trees and stumps, to within 2 inches of natural ground, chipping and disposing of the cuttings. Clearing also includes the removal of all snow and ice in the project area.
- B. Grubbing: Includes the removal and disposal of all stumps, roots, organics, buried logs, brush and other objectionable material down to in-situ mineral soils.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. CONTRACTOR shall perform all clearing and grubbing operations where designated on the Contract Drawings and as specified herein or as directed by the owner.
  - 1. Locate, identify and protect utilities from damage.
  - 2. Verify with the Owner any vegetation to remain.

- B. The project site may contain miscellaneous debris including connexes, inoperable construction equipment, construction material, and other debris. CONTRACTOR must coordinate with the appropriate owner or governing authority as necessary to relocate all materials, waste, and equipment that interfere with proposed improvements to approved offsite location.

### **3.2 PROTECTION**

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

### **3.3 USE AND DISPOSAL OF GRUBBED MATERIAL**

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

**END OF SECTION**

**SECTION 31 23 00**  
**EXCAVATION AND FILL**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This item consists of furnishing all labor, equipment, supplies, and material in performance of all earthwork operations including construction of foundations, earthen pads/embankments, access road(s), earthen dikes, laydown areas, and other applicable features of the work.
- B. CONTRACTOR shall make his own determination of the adequacy of the site to support equipment and other construction loads. Additional fill material and/or crane mats may be required to support loads during construction and CONTRACTOR shall provide additional fill and/or crane mats as required at no additional cost to the Owner.

**1.2 RELATED REQUIREMENTS**

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

**1.3 QUALITY CONTROL ASSURANCE**

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

- testing.
2. Provide certified test results as required in Section 1.4, Submittals.
  3. Fill material placed prior to ENGINEER approval of test results is at the sole risk of the CONTRACTOR. Material not meeting requirements shall be removed and replaced at CONTRACTOR's expense.
- C. Minimum testing requirements are indicated below.
1. Moisture Density and Gradation Analysis:
    - a. Classified Fill: Two (2) samples shall be taken at each Classified Fill material source to be used in the work. One (1) additional sample shall be taken when any change in material occurs which, in the opinion of the Engineer, may significantly affect the optimum moisture content or maximum laboratory dry density.
    - b. If laboratory tests indicate that the fill material does not meet the specification requirements, the CONTRACTOR shall provide additional certified tests for alternative fill material sources at no additional cost to the Owner or 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 in-place density testing shall be borne by the CONTRACTOR.

#### **1.4 SUBMITTALS**

- A. Submittals shall be made in accordance with the General Conditions, Division 1, and this Section.

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

## **1.5 MATERIAL SOURCES**

- A. Classified Fill: There are operating borrow sources for classified material in both Nikolai and Venetie. Some processing will likely be required to meet classified fill gradation requirements. However, the intent of the contract is for the CONTRACTOR to utilize the local material sources for satisfying classified material needs. Contractor shall be responsible for procuring and transporting all classified fill required for this project. Contractor responsibilities shall include, but not be limited to, procurement of fill, transportation, processing, testing, offloading, storage, placement, and compaction.

- B. It is the responsibility of the CONTRACTOR to select a material source for the project and supply material that meets the requirements for Classified Fill materials.
- C. The CONTRACTOR shall coordinate as necessary with the borrow pit surface and subsurface property owners, shall acquire all necessary permits and/or material sales agreements, and shall pay all required fees, royalties, and other costs associated with pit access and material extraction.
- D. The Owner is not responsible for fill lost during transportation.

## **PART 2 - PRODUCTS**

### **2.1 UNCLASSIFIED EXCAVATION**

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

### **2.2 CLASSIFIED FILL MATERIALS**

- A. Fill Material shall meet the requirements for Classified Fill material listed below.
- B. Classified Fill:
  - 1. Classified fill material shall consist of mineral soil, free from dirt, muck, frozen chunks, clay balls, roots, organic material, debris, or deleterious material. It shall have a liquid limit no greater than 25 and a plasticity index no greater than 6 as determined by AASHTO T-89 and T-90.
  - 2. Type I (Pit Run) classified fill material:  
  
Type I (Pit Run) classified fill material shall conform to the following gradation as determined by AASHTO T-27:

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

3. Type II (1" Minus) classified fill material shall be screened and/or crushed gravel consisting of sound, tough, durable rock fragments of uniform quality and shall meet the following gradation as determined by AASHTO T-27:

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

- C. Pipe Bedding Material: Use Type II (1" Minus) classified material.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

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

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

### **3.2 EXCAVATION**

- A. Excavate to lines and grades shown on the Contract Drawings. Remove and dispose of all topsoil, dirt, muck, frozen chunks, clay balls, roots, organic material, debris, or deleterious material.
- B. At CONTRACTOR's option, unclassified excavation may be stockpiled and tested for conformance with classified fill specifications. See Part 1 of this specification for testing requirements.
- C. Disposal of Excess Excavation:
  - 1. Dispose of all excess excavated materials offsite. CONTRACTOR shall make arrangements for the disposal of the excavated material and bare all costs incidental to such disposal.
  - 2. Sideslopes of excavation waste piles shall be sloped to match the materials natural angle of repose, or flatter.
  - 3. Excavation waste areas shall be completely within the limits of the disposal area property.
- D. Dewatering:
  - 1. Excavate all materials in a dewatered condition unless approved otherwise by the Project Manager.
  - 2. Dewatering shall be performed in accordance with the requirements of Section 31 23 19, Dewatering and Control of Surface Water.
- E. Unauthorized Excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or neat-line dimensions without written direction by the Project Manager.
2. Unauthorized excavation, as well as remedial work as directed, shall be at CONTRACTOR's expense.
3. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

### **3.3 SITE PREPARATION**

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

### **3.4 EMBANKMENT CONSTRUCTION**

- A. Embankment Fill Placement:
  1. The specified material shall be placed at the locations and to the lines and grades indicated on the Contract Drawings. The material shall be

placed and spread uniformly in successive layers not exceeding eight (8) inches in loose thickness. The 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 3.5 of this Specification.

2. Blading, rolling, and tamping shall continue until the surface is smooth, free from waves and irregularities, and conforms to elevations shown on the Contract Drawings. If at any time the material is excessively wet; it shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory. The surface shall then be compacted and finished as specified above.
3. Oversized material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

### **3.5 COMPACTION**

- A. Compact each embankment lift to 95% of maximum density at optimum moisture content as determined by ASTM D1557 or AASHTO T-180, Method D.
- B. Correct improperly compacted areas or lifts if soil density tests indicate inadequate compaction.
- C. Portions of any lift in which the materials become segregated or unworkable due to pumping/moisture content 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 specified percent compaction is attained.
- D. 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 Project Manager until specified density is obtained, at no additional cost to the Owner.
- E. The CONTRACTOR shall be responsible for providing the proper size and type of compaction equipment and for selecting the proper method of operating said equipment to attain the required compaction density.

### **3.6 GRADING**

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

### **3.7 MAINTENANCE**

- A. As necessary, CONTRACTOR shall water the site while grading is in progress to control dust.
- B. CONTRACTOR shall protect newly graded areas from traffic and erosion and keep free of trash and debris.
- C. CONTRACTOR shall repair and re-establish grades in settled, eroded and rutted areas as directed by the Project Manager.
- D. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- E. All open excavations shall be adequately signed and barricaded to protect the public.

### **3.8 DENSITY TEST RECORD DOCUMENTATION**

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

**END OF SECTION**

**SECTION 31 23 19**  
**DEWATERING AND CONTROL OF SURFACE WATER**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

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

**1.2 SYSTEM DESCRIPTION**

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

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Selection of equipment and materials to perform the work is at the option of the Contractor.
- B. The Contractor shall be responsible for preparation of any required Storm Water Pollution Prevention Plan.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Contractor shall make his own provisions for diverting surface run off, alleviating ponding water, and dewatering excavation when ground water is encountered.
- B. Contractor shall be responsible for coordinating, acquiring, and paying for all permits required for dewatering operations.
- C. Remove ponded water and limit water flowing or infiltrating into the work area to the extent that the quality of work is not compromised.
- D. Surface water flows within the work area shall be diverted by constructing temporary ditches, berms, or other means to control and direct the water away from the work; use of pumping equipment may be required to

dewater some areas.

- E. Discharge from dewatering operations shall be returned to natural drainage routes. Settling pits, silt fences, straw dikes, or other appropriate measures shall be taken to prevent highly turbid waters from entering existing ponds, streams, or wetlands.

**END OF SECTION**

**SECTION 31 23 33**  
**TRENCHING AND BACKFILL FOR UTILITIES**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

- A. The Work under this item includes furnishing all labor, materials and equipment to perform all operations pertaining to trenching and backfill for utilities.
- B. Buried utilities covered include but are not limited to electrical distribution, heat recovery, fuel oil, and electrical power and control circuits. See Sections for each utility for additional requirements.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 11 14 - Direct Bury Fuel Piping
- B. Section 26 00 00 - Electrical Methods and Materials
- C. Section 31 23 00 - Excavation and Fill
- D. Section 33 61 14 - PEX Arctic Pipe
- E. Section 33 71 01 - Underground Electrical Distribution

**1.3 PROTECTION**

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

**1.4 QUALITY CONTROL ASSURANCE**

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

1. Moisture Density and Gradation Analysis on Classified and Unclassified Materials: One (1) sample for approval, prior to use, plus one (1) additional sample when any change in material occurs which, in the opinion of the 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 200 lineal feet of trench.
  - b. If approved by Engineer, a compactive effort protocol may be established to reduce the number of in-place density tests required.

## **1.5 SUBMITTALS**

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

## **PART 2 – MATERIALS**

### **2.1 TRENCH BACKFILL**

- A. Material for trench backfill shall be obtained from the trench excavation except for bedding material as specified and indicated.
- 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 Engineer may direct the Contractor to furnish Classified Fill material.

### **2.2 LOCATOR/WARNING TAPE**

- C. Metallic Locator/Warning tape shall be capable of being inductively detected electronically. Tape shall be as manufactured by Lineguard, Inc., Wheaton, Illinois, (708)-653-0271, Reef Industries, Inc., Houston, Texas, (713)-943-0070, or approved equal. 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**

### **3.1 PREPARATION**

- A. Identify all existing underground utilities. Stake and flag their locations.
- B. Maintain and protect the existing utilities that may pass through the work area. The Contractor shall coordinate with UUI, the City and Village, and all other local utility companies before beginning excavation activities.

### **3.2 EXCAVATION**

- A. Excavate the subsoil required for installing piping and conduits.
- B. Cut trenches sufficiently wide to enable proper installation and inspection of utilities as specified and shown on the Contract Drawings.
- C. Remove and dispose of all organic material and debris from trench excavation.
- D. Correct unauthorized excavation or over-excavated areas at no cost to the Authority.
- E. All trenching depths specified are minimum as measured from the final grade to the top surface of the utility. The routing shall be as shown on the plans and specifications unless conditions encountered are such that changes are necessary to accomplish the work. In such event, the Owner shall be notified promptly.
- F. Where trenches are intended for more than one utility, particular care must be taken to provide for extra depth and width to allow for soil falling into the trench during the laying of the first utilities.
- G. The contractor will be provided approximate coordinates for each proposed above grade structure (transformer, sectionalizing cabinet, etc.). All trenches shall follow straight lines between staked points whenever possible while also staying fully within established Rights of Way and / or utility easements. The trenches shall be dug so that the bottom has a smooth grade. Rocks in excess of one inch shall be removed from the bottom of the trench. Conductors shall be bedded in sand as shown on the drawings.
- H. Construction shall be arranged so that trenches will be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of trench collapse due to other construction activity, rain, accumulation of water in the trench, etc.
- I. Install buried utility marking tape as required by the RUS construction units and as shown on the drawings.
- J. Existing utilities shown on the Plans are based on incomplete records. Contractor shall coordinate with Local Utilities and have appropriate materials on hand to repair water, sewer, communication, and electrical utility damage that may occur as a result of construction activities. Contractor shall repair damaged utilities at no additional cost to the project.

### **3.3 DISPOSAL SITES**

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

### **3.4 TRENCH BACKFILL**

- A. The first lift is to provide at least a 6-inch bedding thickness under the pipeline and shall be placed before the pipe is laid in the trench. Subsequent lifts of not more than 8-inches shall be installed and individually compacted to 95% of maximum density as described in Section 31 23 00 Excavation and Fill, of these Specifications.
- B. Backfill within the pipe zone shall consist of 1" minus bedding material unless otherwise shown on the drawings.
- C. No blocking of any type shall be used to adjust the pipe to grade.
- D. 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.
- E. The Contractor shall exercise caution when compacting above pipes to ensure that the pipes and coatings are not damaged by compaction and backfilling operations. All pipes or coatings damaged during backfill or compaction operations shall be repaired or replaced by the Contractor, at no expense to the Owner.

### **3.5 FIELD QUALITY CONTROL**

- A. Notify the 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 32 05 09**  
**GEOTEXTILE AND GEOMEMBRANE FABRICS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

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

**1.2 RELATED REQUIREMENTS**

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

**1.3 SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**1.5 QUALITY ASSURANCE**

- A. Manufacturer: The manufacturer of the geomembrane and geotextile materials shall have a minimum of ten years' experience in their respective fields.
- B. Sampling and Compliance Requirements:
  - 1. A competent laboratory must be maintained by the producer of the fabric

- at the point of manufacture to insure quality control in accordance with ASTM testing procedures.
2. That laboratory shall maintain records of its quality control results and provide, upon request of the specifying agent prior to shipment, a manufacturer's certificate.
  3. The certificate shall include:
    - a. Name of manufacturer.
    - b. Chemical composition.
    - c. Product description.
    - d. Statement of compliance to specification requirements.
    - e. Signature of legally authorized official attesting to the information required.
- C. Weather Limitations: All work shall be performed under weather conditions recommended by the manufacturer.

## **PART 2 - PRODUCTS**

### **2.1 GEOTEXTILE FABRIC**

- A. Non-Woven Geotextile: Geotex 601, or approved equal.
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	TEST	
PROPERTY	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

**B. Geomembrane Liner: Cooley L1023DEP**

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

SPECIFICATION	TEST	
PROPERTY	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	-30°F	ASTM D-2136
Ply Adhesion	10 lbs.	ASTM D-751

**2.2 LINER SEAMING**

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

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF GEOTEXTILE FABRICS**

#### **A. Preparation:**

1. Prepare subgrade and embankment as specified.
2. Grade to a smooth surface, leaving no surface undulations or irregularities that the fabric can stretch and “bridge” over.
3. Remove any loose and angular materials, rocks and sticks that may damage the fabric.

#### **B. Installation:**

1. The geotextile fabric sheet shall be unrolled, positioned, and drawn tight without stretching, in accordance with manufacturer’s recommendations.
2. Geomembrane liner shall be crated to prevent any damage during shipping. Provide an unfolding map which indicates where the liner bundle needs to be positioned to allow for ease in unfolding at the site. Install liner in accordance with the manufacturer’s instruction by a certified installer. Install between layers of non-woven geotextile for protection.
3. No penetrations are allowed through the geomembrane liner.
4. Place the geomembrane liner directly over the rigid insulation as shown on the Drawings. Remove all rocks and debris from the rigid insulation prior to placing the liner. Cover the liner with a layer of geotextile fabric prior to placing fill.
5. Construction vehicles will not be allowed to travel directly on the fabric.
6. Take due care to ensure that fabric is not damaged during construction activities.
7. Fabric or liner damaged to a degree that compromises its intended capabilities shall be replaced with same approved product at no additional cost to the Authority.

### **3.2 FILL PLACEMENT**

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

### **3.3 GEOTEXTILE FABRIC REPAIR**

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

### **3.4 GEOMEMBRANE REPAIR**

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

**END OF SECTION**

**SECTION 32 31 13**  
**CHAINLINK FENCES AND GATES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. The work covered by this section includes the furnishing of all labor, tools, equipment and materials necessary to furnish and install chainlink fence and gates as shown on the Contract Drawings and described in this Specification.

**1.2 REFERENCES**

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

**1.3 DEFINITIONS**

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

**1.4 SUBMITTALS**

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

## **1.5 QUALITY ASSURANCE**

- A. The manufacturer shall be experienced and regularly engaged in the supply and installation of fence materials. The manufacturer shall understand the system design and its intent and shall produce components suitable to accomplish that intent. Any deficiencies in the Contract Drawings or these Specifications which may jeopardize the performance of the system shall be brought to the immediate attention of the Project Manager, prior to submittal of product description and information for acceptance, whenever possible.

## **1.6 IDENTIFICATION**

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

## **1.7 DELIVERY, STORAGE AND HANDLING**

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

## **PART 2 - PRODUCTS**

### **2.1 NEW FENCING MATERIALS, POSTS AND ACCESSORIES**

- A. Zinc-Coated Steel Wire Fabric:
  - 1. Type 1-1.2 oz/sq ft , 2-inch mesh, 9 gauge
  - 2. Fabric selvage to be twist, twist.
  - 3. Provide three strands of 12.5 gauge, 4-point, class III barb wire.

- B. Tension Wire for top and bottom of Fabric: 7 gauge, coil spring steel, Class III
- C. All pipe should be SS40 Standard Fence Pipe. Posts and Braces (Class 1, zinc-coated steel pipe, Grade A or B):
  - 1. Line Posts: 2.375-inch O.D. and weight of 3.12 lb/ft.
  - 2. End, Corner, Man Gate and Pull Posts: 2.875-inch O.D. and weight of 4.64 lb/ft.
  - 3. Gate Posts: 4-inch O.D. and weight of 6.56 lb/ft.
  - 4. Brace Rail: 1.66-inch O.D. and weight of 1.84 lb/ft.
  - 5. Top Rail: Use top Tension wire unless otherwise noted.
- D. Gates:
  - 1. Size and type shown on Drawings.
  - 2. Class 1 steel pipe, Grade A or B, 1.90-inch O.D. and weight of 2.28 lb/ft.
  - 3. Gate leaves 6 feet wide and wider shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.
  - 4. Gate leaves less than 6 feet wide shall have truss rods or intermediate braces.
  - 5. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted.
  - 6. All hardware shall be zinc-coated.
  - 7. Latches:
    - a. Frost free or strongarm latch for double gates, fork latch for single man gates.
    - b. Latches shall be arranged for pad-locking so that the padlock will be accessible from both sides of gates.
- E. Accessories: Ferrous accessories shall be zinc-coated steel.
  - 1. Tension bars: 1/4 -inch x 3/4-inch flat bar.
  - 2. Standard tension bands: 1/8-inch x 1-inch with 5/16-inch carriage bolt.

3. Wire Ties and Clips: 9 gauge.
  4. Steel Hog Rings: Aluminum or steel post ties
  5. Truss Rods: 3/8-inch diameter.
- F. Zinc Coating:
1. All steel and iron parts will be zinc-coated after fabrication in accordance with FS RR-F-191.
  2. Weight of zinc coating per square foot of actual surface shall average not less than 1.2 ounces and no individual specimen show less than 1.0 ounce.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

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

#### **3.2 POSTS**

- A. Spacing: Space posts equidistant measured on a horizontal line; on straight runs, space at 10 feet maximum.
- B. Location:
  1. Locate terminal posts (end, corner, and gate) at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments.
  2. On straight runs, brace posts in two directions to act as pull posts.
- C. Setting:
  1. Set posts plumb and to the depth shown on the Drawings.
  2. Posts to be placed to minimum 5-foot embedment or as indicated on the Drawing.

- D. Testing:
1. Fence post rigidity shall be tested by applying a 50-pound force on the post, perpendicular to the fabric, at 5 feet above ground
  2. Post movement measured at the point where the force is applied shall be less than or equal to  $\frac{3}{4}$ -inch from the relaxed position.
  3. Every tenth post shall be tested for rigidity; when a post fails this test, further tests on the next four posts on either side of the failed post shall be made. Posts failing the rigidity test shall be buried deeper or anchored with a minimum of 1 cubic foot of 2500 psi concrete placed at the base of the post.

### **3.3 INSTALLING FABRIC**

- A. Place fabric on the outside of posts around the area enclosed.
- B. Cut fabric by untwisting a picket, and attach each span independently at all terminal posts.
- C. Attach one end and then apply tension to remove all slack and attach other end, using stretcher bars with tension bands at maximum 15-inch intervals or any other approved method.
- D. The installed fabric shall have a smooth, uniform appearance, free from sag.
- E. Install fabric 2 inches above ground level with a tolerance of plus or minus 1-inch at each post.
- F. Fasten fabric to line posts at intervals not to exceed 15 inches and to the top and bottom tension wires at intervals not to exceed 24 inches.
- G. Join sections of fabric by weaving a single picket into the ends of the rolls to form a continuous mesh.

### **3.4 BRACES AND TRUSS RODS**

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

### **3.5 TENSION WIRES**

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

### **3.6 GATES**

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

### **3.7 INTERMEDIATE CLIPS**

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

### **3.8 GROUNDING**

- A. Electrical grounds shall be installed along the fence as shown on the plans. Electrical grounds shall also be installed where a power line passes over the fence.

### **3.9 TEMPORARY FENCE**

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

continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

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

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

**END OF SECTION**

**SECTION 33 05 00**  
**COMMON WORK RESULTS FOR UTILITIES**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

- A. Provide all labor, materials, equipment, and test equipment necessary to furnish, install, and place into operation the new underground and overhead electrical distribution system, heat recovery arctic pipe systems, and liquid fuel systems as indicated on the drawings, specifications, and staking sheets.
- B. Demolish the existing underground and overhead electrical distribution systems and liquid fuel systems as indicated on the drawings, specifications, and staking sheets.
- 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. Prior to commencing with the work, the Contractor shall prepare and submit a schedule for the construction activities associated with the installation and startup. The schedule shall identify the routing of the new system and the means to maintain electrical service throughout construction.
- F. 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.
- G. The electric utility is the City of Nikolai for Nikolai and Venetie Village Electric for Venetie, herein after referred to as the electric utility or utility. All construction activity shall be closely coordinated with the utility. The existing underground electrical distribution system effected by the project serves existing customers. At all times service shall be maintained to the customers except when outages are required for service conversion or other construction related activities. All outages shall be coordinated in advance with the City and shall be kept as short as possible.
- H. The City of Nikolai and the Village of Venetie maintain existing buried and above grade piped water and sewer systems. As built for the existing system are not available. The contractor shall coordinate with the local water/sewer utility personnel and keep necessary materials on hand to perform repairs to the existing buried utilities on an as-needed basis. The contractor shall be fully responsible for the cost of all labor and materials necessary for repair of existing utilities damaged as a result of contractor activities. No additional payment will be made

to the contractor for repairs to existing utilities damaged as a result of contractor activities.

- I. At certain times, roads will be required to be closed or construction activities will interfere with pedestrian or property owner access. All City requirements for road closing or limited access shall be followed at all times. Obtain a copy of the City requirements prior to beginning construction. Any required signs, barricades, or other equipment required for traffic control shall be provided by the Contractor. All activities that limit access to public or private property or right of ways shall be coordinated with the City of Nikolai.
- J. The contractor shall coordinate with the FAA and the Alaska Department of Transportation (DOT) for all work on or around the airport. The Contractor shall prepare, complete, and provide all notices for air traffic, in the form of NOTAMs or other notifications that the FAA may require, to the FAA and DOT when the existing navigational aids are affected.

## **1.2 RELATED REQUIREMENTS**

- A. This section applies to all Division 33 work.
- B. See Division 1 which contains information and requirements that apply to work specified herein.

## **1.3 TELEPHONE SERVICE**

- A. Telephone service is included in this project as indicated on the Drawings. In addition, the contractor shall be responsible for repairing any damage to the telephone system resulting from contractor activities.

## **1.4 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 editions of the following specifically noted requirements:
  - 1. NFPA 70, National Electric Code – NEC.
  - 2. ANSI-C2, National Electrical Safety Code – NESC.
  - 3. RUS Bulletin 1728F-806.
- 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. Factory Mutual – FM.
  - 4. Institute of Electrical and Electronics Consultants – IEEE.
  - 5. National Electrical Contractors Association – NECA.

6. National Electrical Manufacturers' Association – NEMA.
  7. National Fire Protection Association – NFPA.
  8. Underwriters Laboratory – UL
- C. If the Contractor observes that the Drawings and/or Specifications are at variance with such codes and regulations, he shall promptly notify the Authority in writing.
  - D. Should the Contractor perform any work in non-compliance with the above-mentioned codes and regulations without such notice to the Authority, the Contractor shall bear all costs arising therefrom.
  - E. 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.

### **1.5 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. "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.
- C. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
- D. "Provide" means furnish all products, labor, sub-contracts, and appurtenances required and install to a complete and properly operating, finished condition.
- E. "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.
- F. "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.
- G. "Product" is a generic term which includes materials, equipment, fixtures, and any physical item used on the project.

### **1.6 SPECIAL CONDITIONS**

- A. Contactor shall ensure that appropriate safety measures are implemented and that all workers are aware of the potential hazards from electrical shock associated with working on or near energized medium voltage distribution equipment.

- B. All electrical work shall be performed by Alaska licensed Journeyman Electricians or licensed Apprentice Electricians under the supervision of a licensed Electrical Administrator, unlimited line work outside.
- C. Submit written proof of all Journeyman and Apprentice Electricians' current licenses.
- D. Perform work with skilled craftsmen specializing in said work. Install all materials in a neat, orderly, and secure fashion, as required by these specifications and commonly recognized standards of good workmanship.

### **1.7 DRAWINGS, SPECIFICATIONS, STAKING SHEETS, & SYMBOLS**

- A. The Drawings, Specifications, and Staking Sheets are complementary; what is shown on one is as binding as if called for in both. Do not scale the Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
- B. The Drawings are partly diagrammatic and do not show precise routing of circuits 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 Drawings or in the specifications.

### **1.8 SUBMITTALS**

- D. Provide submittals for all products and systems described in Division 33 specifications and/or shown on the Drawings and Staking Sheets to demonstrate compliance with the requirements of the project. Furnish submittals in the manner described herein, and in Division 1 with an index following specification format and with item by item identification.
- E. Provide submittals for all materials in the Division 33 specification sections which follow and submit under that specification section.
- A. Under this specification section provide submittals for any products and systems shown on the Drawings or Staking Sheets that are not referenced under a Division 33 specification. Identify by the Drawing or Staking Sheet reference.
- B. Submittals shall demonstrate compliance with the requirements of the project. Furnish all relevant data as appropriate including but not limited to:
  - 1. Manufacturer's name and address, and supplier's name, address, and phone number.
  - 2. Catalog designation or model number with rough-in data and dimensions.
  - 3. Operation characteristics.

4. 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.
  5. Wiring diagrams for the specific system.
  6. Coordination data to check protective devices.
  7. Shop Drawings.
- C. Submittal Data:
1. Transformers.
  2. Electrical Utilities Material and Equipment.
  3. Raceways, Fittings, and Supports.
  4. Conductors, Wire, and Cable.
  5. Arctic pipe systems.
  6. Liquid Fuel Storage Tanks, Piping, Pumps, and Equipment.
  7. Additional items that may be indicated on the Drawings.
- D. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment. 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.

## **1.9 COORDINATION**

- A. Drawings are partly diagrammatic and it is not the intent to show in detail all features of work or exact physical arrangement of equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance.
- B. If equipment is placed incorrectly with respect to accessibility and required operating clearances, the work affected shall be removed and re-installed at the Contractor's expense.
- 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 operating clearances. Should the Contractor become aware of operating clearances violation or if the installation of electrical equipment as shown produces an operating clearances violation, notify the Authority in writing before proceeding with the installation.

### **1.10 DEVICES AND EQUIPMENT**

- A. Devices and equipment shall be listed for the intended service. Manufacturers or model numbers shown on the drawings or in the specifications is provided to indicate the required features. Substitutions of equivalent items will be accepted unless items specifically indicate no substitutes.
- B. Install all equipment such that the minimum required operating clearances are maintained.
- C. Protect all materials and equipment during the entire duration of construction work against contamination or damage. Replace or repair to original manufactured condition any items damaged during construction. Immediately report to the Authority any items found damaged prior to commencing construction.

### **1.11 INSPECTIONS**

- E. Provide advance written notice to the Authority in accordance with Section 01 77 00 - Contract Closeout Procedures to schedule substantial completion inspection. The Authority will generate a punch list of corrective action items during the inspection. Work will not be considered complete until all corrective action items in the Authority's punch list have been satisfactorily completed and photographic or other positive documentation has been provided to the Authority.
- F. Cooperate with the Authority 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 Authority, will be necessary to determine the completeness, quality, or adequacy of the work.

### **1.12 STAKING SHEETS**

- A. Staking sheets are included as part of the Contract Documents. RUS Units referenced have not been included unless the Unit has been modified by this project. Contractor shall obtain copies of the RUS Units and keep them on the jobsite at all times for reference.

### **1.13 RECORD DRAWINGS & STAKING SHEETS**

- A. Reference requirements stated elsewhere in these specifications.
- B. In addition to other requirements, mark up a clean set of Drawings and Staking Sheets as the work progresses, to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show complete routing and sizing of any significant revisions to the systems shown.
- C. Maintain Record Drawings and Staking Sheets 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 Authority at all times.

- D. Prepare wiring diagrams on reproducible media using AutoCAD V.2012 or later for all individual special systems as installed. Identify all components and show all wire and terminal numbers and connections.
- E. Prior to substantial completion, deliver these drawings and staking sheets and their electronic files in both .dwg and full size .pdf format to the Authority and obtain a written receipt.

#### **1.14 PROJECT COMPLETION AND DEMONSTRATION**

- A. Division 1 - Closeout Requirements.
- 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 until compliance is attained.
- 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.

#### **1.15 TESTS**

- A. Division 1 - Closeout Requirements.
- B. The Contractor shall be responsible for field testing all electrical systems and equipment shown on the drawings.
- C. The Contractor shall prepare and submit a test plan for review and approval by the Authority.
  - 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 Authority,
    - 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.
    - c. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.
- D. Report all test results in writing. Where tests disclose problem areas, retest after the defect has been corrected.

- E. 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.
- F. 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.

**PART 2 – MATERIALS**

Not used.

**PART 3 – EXECUTION**

Not used.

**END OF SECTION**

## **SECTION 33 52 13**

### **LIQUID FUEL PIPING AND EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 RELATED REQUIREMENTS**

- A. Section 00 70 00 – General Conditions.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Section 33 05 00 – Common Work Results for Utilities

##### **1.2 WORK INCLUDED**

- A. Scope: This section applies to all fuel systems installed above grade at the bulk fuel tank farm and retail dispensing facilities.
- B. Section includes:
  - 1. Piping and Fittings.
  - 2. Piping Specialties.
  - 3. Fittings, Valves, and Strainers, etc..
  - 4. Dispensers.
  - 5. Pipe Supports.
  - 6. Pipe and Pipe Support Coatings.

##### **1.3 SUBMITTALS**

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

- E. Pipe coating process and schedule.
- F. Inspection and Testing Procedures and Results.
- G. Welding procedure qualification Records (PQRs) and welding procedure specification.

#### **1.4 REFERENCED STANDARDS**

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

1. NFPA 30, Flammable and Combustible Liquids Code.
2. NFPA 31, Standard for the Installation of Oil Burning Equipment.

## 1.5 QUALITY ASSURANCE

- A. Comply with all applicable federal and state codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances shall govern.

## PART 2 - PRODUCTS

### 2.1 GENERAL

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

### 2.2 PIPING AND FITTINGS

- A. Exterior Above Grade Piping:

1. Steel Pipe:
  - a. Unless otherwise noted on the drawings, Pipe larger than 1" and located outside of the diked containment area shall be schedule 80, seamless, ASTM A106, grade "B".
  - b. Pipe larger than 1" and located inside of the diked containment area shall be schedule 40, seamless, ASTM A106, grade "B".
  - c. Pipe 1" and smaller schedule 160, ASTM A106 grade "B".
2. All piping & fittings shall be buttwelded or socket welded except where shown on drawings or required for equipment connection.
3. Pipe Fittings: Buttweld elbows, tees, and reducers shall be seamless, ASTM A234, grade WPB, schedule shall match adjacent piping. Buttweld elbows shall be long radius. Schedule to match pipe wall. Socketweld and threaded fittings shall be ASTM A105, 3000#.
  - a. Pipe and fittings 1-1/2" and larger shall be full penetration butt welded. Flanged fittings shall be ANSI 150 lbs, raised face, weld neck, ASTM A105, bore to match adjacent pipe
  - b. Pipe and fittings smaller than 1-1/2" shall be socket welded. Flanged fittings shall be ANSI 150 lbs, raised face, socketweld, ASTM A105, bore to match adjacent pipe
  - c. Provide flanged connections as required to allow removal of individual components. Threaded fittings are not allowed except where shown on the project drawings, or required for connection to equipment.

- B. Exterior Below Ground Piping

1. Steel Pipe:
  - a. Pipe 1" and larger shall be schedule 80, seamless, ASTM A106, grade "B".

2. Pipe fittings: Carbon steel butt weld conforming to ASTM A234 and ASME B16.9.
3. Pipe and fittings shall be full penetration butt welded.
4. Butt weld elbows, tees, and reducers shall be seamless, ASTM A234, grade WTB, schedule match adjacent piping. Butt weld elbows shall be long radius. Schedule to match pipe wall.
5. Cathodic Protection: Buried pipe shall be cathodically protected.

## 2.3 PIPING SPECIALTIES

### A. Exterior Piping Specialties:

1. Flange Gaskets: Gaskets shall be raised face, spiral wound, with stainless steel winding strip, flexible graphite filler, with carbon steel inner and outer rings, and rated for -50°F service.
2. Dielectric Isolation Flange: Provide where indicated on the project drawings and at all transitions to buried piping. Provide and assemble flanges as indicated on the drawings and as recommended by the manufacturer. Basis of Design: Pikotek VCS or approved equal.
3. Ball Valves 1-1/2" and larger: Full port, ANSI class 150 lbs., Cast carbon steel body, stainless steel ball, Teflon seat and stuffing box seals, lockable lever handle, raised faced flanged. All materials shall be suitable for the service conditions. NACE MR-01-75 Conformance and fire safe per API 607. PBV C-5410-31-2236-FTNL, or approved equal.
4. Ball Valves less than 1-1/2"
  - a. ANSI class 150 lbs., cast carbon steel body, stainless steel ball, Teflon seat and stuffing box seals, lockable lever handle. All materials shall be suitable for the service conditions. Nibco Model No. T-590-CS-R-66-FS-LL, or approved equal.
5. Check Valves: Carbon steel, ANSI class 150 lbs., raised face flanged, swing check valve. Crane No. 147, or approved equal. Smaller than 2", Bonney Forge L1-61 piston check valve or equal.
6. Wye Strainer: Flanged, carbon steel body, bottom clean-out "Y"-strainer with 1/16" perf. mesh, and blow off tapping plug. Mueller Fig. 781, or approved equal. Provide blow off tapping with lockable ball valve and threaded plug for blow down.
7. Basket Strainer: Flanged, carbon steel body, bottom clean out, bolted top cover, basket with 1/4" perf. mesh, and blow off tapping plug. Mueller Fig. 185 or approved equal. Provide blow off tapping with lockable ball valve and threaded plug for blow down.
8. Flex Fittings: ANSI Class 150 lbs., stainless steel annular corrugated

- inner core with stainless steel braided cover, fixed flanged end by floating flanged end with 18" live length or as specified otherwise on project drawings or required for equipment connection. Pressure test at 110 psi and provide certification for each flex. Metraflex Metra-Mini, or approved equal.
9. Pressure Relief Valves: For thermal expansion relief, raised face flanged, carbon steel body pressure relief valve set as specified on drawings. PSV's shall be Hydro-seal Model No. 30FL1CV-00 OAE for 2" and 1FLAXV-00 OAE for 1", and relief pressure set as indicated on project drawings, or equal.
  10. Anti-Siphon Valve: Normally closed, stainless steel body, with special expansion relief set at 25 psi. Valve set to open at 20 feet head pressure. Morrison Bros Figure 910ER, or approved equal.
  11. Actuated Ball Valves: Normally Closed, ANSI class 150 lbs, A350LF2 body, buna seats and seals. 350 in-lbs operating torque at -50°F, PTC self-regulating heater, NEMA 7 enclosure without manual override shaft extension, Exxon Beacon 325 severe cold grease, 115 V AC, 600 in-lbs torque: 10 second stroke time, stainless steel mounting hardware to allow for manual operation using #10 adjustable wrench, actuator rated to -50°F. 2" ball valve shall be Nutron model#T3-R20R01LZ with RCS model SXR-1023 actuator, no substitutes.
  12. Quick Connect Couplings: Aluminum body cam and groove fitting with dust cap. Male fitting with ANSI 150-pound class flanged MPT or FPT connection, as shown, 150 psig minimum working pressure. PT Coupling or approved equal.
  13. Cam Lock Couplings: Aluminum body cam and groove male fittings with FNTP connection, 150 psi minimum working pressure. Provide dust cap with Buna-N seal for each fitting provided. PT couplings or equal.
  14. Dry break coupling: Aluminum body cam and groove fitting with dust cap with ANSI 150-pound class flanged, MPT, or FPT connection as shown on the Contract Drawings. 150 psig minimum working pressure. Each dry break coupling to include dust caps and appropriate adapters to connect to standard camlock fittings of the same size. PT Coupling Maxi-Dry Series MD20A or approved equal.
  15. Strainers: Flanged, carbon steel body, bottom clean-out Y-strainer with #10 mesh and blow-off tapping plug. Mueller Fig. 781, or approved equal.
  16. Utility Markers: Continuous glass fiber and resin reinforced marker, one-piece, vandal and vehicle impact resistant. Provide Carsonite CUM 375 or approved equal.

## 2.4 PIPE SUPPORTS

- A. All pipe supports, clamps, fittings, and hardware shall be hot dipped galvanized

(HDG).

- B. Support strut: HDG Steel finish and slotted back unless specifically indicated otherwise.
  - 1. Standard strut: 12 gauge, 1-5/8 inch by 1-5/8 inch, Unistrut P1000T, or approved equal.
  - 2. Double strut: 12 gauge, 1-5/8 inch by 3-1/4 inch, Unistrut P1001, or approved equal.
  - 3. Post Base: 1-5/8 inch by 1-5/8 inch, Unistrut P1887, or approved equal.
  - 4. Single Strut: 12 gauge, 1-5/8 inch by 1-3/8 inch, Unistrut P3000, or approved equal.
  - 5. Deep Strut: 12 gauge, 3-1/4 inch by 1-5/8 inch, Unistrut P5000 , or approved equal.
  - 6. Shallow strut: 14 gauge, 1-5/8 inch by 13/16 inch, Unistrut P4100T or approved equal.
  - 7. Solid back strut: For welding to tanks or structures, 12 gauge, 1-5/8 inch by 1-5/8 inch, unfinished black steel, Unistrut P1000 (SS), or approved equal.
- C. Provide HDG steel fitting, brackets, channel nuts and accessories designed specifically for use with supplied strut.
- D. Pipe Clamps: HDG steel two-piece pipe clamp designed to support pipe tight to strut. Unistrut P1117E and P1119E or approved equals.
- E. Pipe Straps: HDG steel two-hole pipe strap. Unistrut P2558 or approved equals.
- F. Fasteners:
  - 1. Bolts, nuts and washers: HDG.
  - 2. Lags: HDG.

## **2.5 PIPE AND PIPE SUPPORT COATINGS**

- A. Coating processes shall be submitted to the engineer for approval prior to pipe coating.
- B. Above Grade Steel Pipe:
  - 1. After field fabrication is complete paint all exposed carbon steel pipe and fittings. Wire brush and wipe down with solvent. Prime and finish with two coats of Cold Galvanizing Compound, ZRC or approved equal.
  - 2. Label all above grade piping as to contents and provide flow direction

arrows in accordance with ASME A13.1. Arrows may be painted stencils or high quality printed stickers. Maximum flow direction arrow spacing shall be 10 feet measured along pipe length, minimum of one arrow per pipe segment. Color shall be black. Periodically label each pipe run every 50-feet and as required for proper labelling.

## 2.6 FUEL DISPENSERS AND APPURTENANCES

- A. Dual Product Dispenser: UL listed dispenser for use with remote submersible pump. Five figure mechanical register with tenths of a gallon as the smallest unit. Non-resettable totalizer, lighted display, 10:1 pulser, 110 VAC powered. Provide interal 30-micron, spin on filter and 10 spare elements. Dispenser shall be certifiable for retail sales. Prior to delivery replace factory supplied standard grease in mechanical register ith a severe cold arctic-grade lubricant. Two hose, dual product dispenser, Gasboy Atlas 8753KXTW2 Or Approved Equal.
- B. Dispenser Appurtenances:
  - 1. Retail Dispensing Facility Arctic Hose: Low temperature (-60 deg F) ¾ inch fuel dispensing hose, 300 psi working pressure, Goodyear Arctic Ortac, or approved equal. Provide hose swivels at each end.
  - 2. Retail Dispensing Facility Breakaway Coupling: UL listed, ¾ inch, breakaway fitting, EBW model# 679-137 with hose connection, or approved equal.
  - 3. Retail Dispensing Shear Valve: 1-1/2" x 1-1/2" shear valve with fusible link. Morrison Bros. Co. model# 636F, or approved equal.
  - 4. Retail Dispensing Facility Hose Swivel: UL listed dispenser hose swivel. OPW model# 45M-0492, or approved equal.
  - 5. Retail Dispensing Hose Nozzle: UL listed, automatic shut-off, automotive fill nozzle with hold open rack and color coded handles (black for gasoline, green for diesel). OPW model#11BP-0400 and 11B-0100, or approved equal.
- C. Coatings: Dispenser structure, floor, and base shall be coated in accordance with 05 50 00. Bolts, nuts, and washers shall be hot dip galvanized in accordance with ASTM A153.

## 2.7 BULK FUEL TRANSFER EQUIPMENT

- A. Meters: Positive displacement meter rated for 100 gpm of continuous flow with a 150 psig working pressure. Accuracy shall be +/- 0.22% or better from 6-60 gpm. Provide 2-inch inlet and outlet companion flanges with o-ring seals, preset counter with direct mechanical linkage to shutoff valve, resetable register, non-resetable totalizer, air eliminator, strainer, microswitch for shutting down transfer pump, and 10 gallon dwell. All elastomeric seals shall be low temperature nitrile rubber (Buna-N). Factory calibrate for No. 1 diesel fuel, or unleaded gasoline as indicated.

1. Resettable registers shall have 0.1 gallon as the smallest division, preset counter with whole gallon increments only.
  2. Liquid Controls M-7-K-1 or approved equal.
- B. Fuel Filter two (2) cartridge in-line filter with Buna-N gasket and grommets, 1 ½” NPT inlet/outlet, 50 psig maximum working pressure 60 GPM capacity. CIM-TEK Centurion III or approved equal. Provide eight (8) Buna-N gaskets (#90005), eight (8) 30 micron hydro sorb type II (#30036), eight (8) Buna-N grommets (#90006), eight (8) filter cartridges (#90002), and two (2) replacement canisters.
- C. Bulk Transfer Arctic Hose: 1 ½ inch diameter with 1 ½ inch NPT connections at each end. Provide 30 foot long section of hose with each hose reel assembly. Goodyear Arctic Ortac or approved equal.
- E. Bulk Transfer Breakaway Connection: UL listed 1 1/2-inch breakaway fitting. OPW model no. 66SP-5150 with custom fabricated 18-inch hose section, 1 ½” NPT connections at each end.
- F. Hose Swivel: UL listed hose swivel. PT Coupling model F0B150MF, or approved equal.
- G. Hose Nozzle: UL listed automatic shut off, heavy duty, high flow fill nozzle with hold open latch and color coded handle, green for diesel #1 and #2 and red for gasoline. OPW 1290-0050, or approved equal.
- H. Hose Reel: Class 1, Div 1 rated, explosion proof electric rewind hose reel capable of holding 50 feet of 1 ½ inch I.D. hose. Reel shall be top rewind. Hannay EPJ 7528-19-21 (Top Rewind) with utility hose rollers and ball stop for 1 ½ arctic hose, or approved equal.
- I. Static Grounding Reel: Enamel coated steel frame and reel with permanently sealed spring return. Provide with 50 feet of 1/8 inch galvanized carbon steel cable, minimum 100 ampere grounding clip, and stop ball. Hannay GR75, or approved equal.
- J. Cam Lock Couplings: Aluminum body cam and groove male fitting with FNPT connection, 150 psig minimum working pressure. Provide dust cap with Buna-N seal for each fitting provided. PT coupling, or approved equal.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF PIPING AND FITTINGS**

- A. General Provisions:

1. Work includes all tank farm piping and distribution piping to and from marine or truck fill headers, bulk storage tanks, and bulk transfer hose reels.
2. All piping shall be fabricated and tested in conformance with ASME/ANSI B31.4.
3. Diagrams: Piping diagrams are schematic only and must not be used for obtaining lineal runs or number and type of fittings.
4. Offsets in Piping: The drawings do not attempt to show exact details of all piping. No extra payments will be allowed where obstructions in the work of other trades, or work under this contract, require offsets in piping.
5. Openings in Pipes: Keep closed during the progress of the work.
6. Installation of Valves: Install valves with stem horizontal or above the horizontal.
7. Connections to Equipment: All piping connections to motor driven equipment shall be made through flexible pipe connectors.
8. Short Pipe Connections: Close nipples are not permitted. For short pipe connections, use standard short nipples.
9. Make threaded joints using pipe joint compound applied to the male threads. Hercules Grip or approved equal.
10. Coat flange gaskets with anti-seize compound prior to assembly.
11. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
12. Flanged Connections: Make up joints with flanged faces true and perpendicular to the centerline of the pipe to which the flanges are attached. Bolts for flanged joints shall be steel square head machine bolts with heavy semi-finished hexagon nuts.
13. Flanges: Wherever welded piping connections to equipment, valves, or other units need maintenance, servicing or require possible removal, the connecting joint shall be flanged. Pressure rating of the pipe flanges shall match the pressure rating of the flanges on the equipment to which the piping connects.
14. Route piping in an orderly manner and maintain gradient
15. Group piping whenever practical at common elevations.
16. Install piping to allow for expansion and contraction without

stressing pipe, joints or connected equipment. Install valves to allow full operation without obstruction of operating handle.

17. Support piping and equipment as shown on the drawings using specified supports and fasteners. If not detailed on the drawings, support from structural members with pipe hangers, clamps or pipe straps specifically intended for the application. Do not support piping from connections to equipment. Provide piping supports spaced per the following table.

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

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

### **3.2 INSTALLATION OF PIPING SPECIALTIES**

- A. Install per manufacturer's recommendations.

### **3.3 UTILITY MARKERS**

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

### **3.4 PRESSURE TESTING**

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

### 3.5 FUEL SYSTEM TESTS

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

**END OF SECTION**

## **SECTION 33 52 23**

### **BULK FUEL TRANFER PUMPS**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

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

##### **1.2 WORK INCLUDED**

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

##### **1.3 SUBMITTALS**

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

##### **1.4 QUALITY ASSURANCE**

- A. The installing contractors shall have the necessary knowledge, skills and equipment to enable proper and safe pump installation.
- B. Storage: Protect pumps from dirt and moisture.

#### **PART 2 - PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers: Subject to compliance with requirements.

Manufacturers offering products that may be incorporated in the work include, but are not limited to the following:

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

## **2.2 PUMPS**

- A. Transfer Pumps: Gray cast iron, self-priming centrifugal pump for petroleum service. 1-1/2 inch NPT inlet & outlet, bronze impeller, self-lubricated Buna-N mechanical seal. Close coupled to 3,450 rpm, 1 hp explosion proof motor, 230VAC, single phase. Pump shall produce 40 gpm at 36 feet total dynamic head. Gorman-Rupp Model 81-1/2D3-X1, No substitutes.
- B. Submersible Pumps: 3/4 hp, 208-230v, single phase, explosion proof submersible turbine pump with intake screen and integral leak detection. Install pump intake to level shown on drawings. Provide Red Jacket NO. P75S1 with trapper intake screen, or approved equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

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

### **3.3 FUEL SYSTEM TESTS**

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

**END OF SECTION**

**SECTION 33 56 13**  
**ABOVE GROUND FUEL STORAGE TANKS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Scope: This section applies to above ground fuel storage tanks and appurtenances.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 11 13 – Power Plant Fuel-Oil Piping.
- D. Section 23 12 13 – Power Plant Fuel-Oil Equipment and Specialties.
- E. Division 26 – Electrical.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Atmospheric storage of diesel fuel with tank rated for -20F liquid temperature.
- B. Overall height of tank including skid, saddles, and permanent attachments shall not exceed 8'-8".

**1.4 REFERENCES**

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

6. B16.39, Pipe Unions, Malleable Iron Threaded.

D. Underwriters Laboratories (UL):

1. UL 142, Steel Aboveground Storage Tank Installation & Testing.
2. UL 2085, Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids.

E. National Fire Protection Association (NFPA):

1. NFPA 30/30A, Flammable and Combustible Liquids Code.

F. National Association of Corrosion Engineers (NACE):

1. Painting and Coatings Standards.

### **1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data: Submit manufacturers catalog literature for tank coating system and for all tank appurtenances including but not limited to tank liquid level indicators, normal/emergency vents, gauge hatches, and overfill prevention valves.
- C. Shop Drawings: Submit shop drawings prior to fabrication, showing all principal dimensions of the tank, details and locations of all accessories, penetrations and appurtenances, thickness of sheets and plates, details of joints and welds and description of coating system. Any deviations from these Specifications and the Drawings shall be clearly shown and identified on the shop drawings.
- D. Submit evidence of manufacturer's current authorization from a third-party listing agency in accordance with Quality Assurance below.
- E. Submit evidence that regional air cargo carriers have reviewed and approved the tank design as suitable for air transport.

### **1.6 CLOSEOUT**

- A. Division 1 - Closeout Requirements.

### **1.7 QUALITY ASSURANCE**

- A. Division 1 – Quality Control.
- B. The tank manufacturer shall have current authorization from a third-party listing agency to provide listed fuel storage tanks of the type specified.
- C. The installing contractor shall have the necessary knowledge, skills, and equipment to enable proper and safe above ground storage tank installation.
- D. Tank Leak Test: Provide tank integrity testing in accordance with UL 142 and 2085.

### **1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with current third party listing authorization.

- B. Installer: Company specializing in performing Work of this section.

### **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Tank Handling: To prevent damage to the tank, use equipment of adequate size to lift and lower the tank without dropping or dragging.
- B. Tank Venting: During shipping and storage the tank shall be provided with venting to relieve pressure on both the primary tank and the interstitial space.
- C. Tank Storage: If the tank must be temporarily stored prior to installation, it shall be placed in an area away from activity where tank damage could occur.

### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to installation.

### **1.11 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, transportation / freight options, and work requirements for all trades and arrange accordingly.
- B. Contractor is responsible for verifying drawing dimensions by making field measurements, coordinating with regional air freight companies, and preparing separate shop drawings.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Materials shall be new unless otherwise specified. All items of the same type shall be of the same manufacturer.
- B. Tank manufacturer to provide shop-welded standoffs as required for bolting on appurtenances in the field. Field welding to finished tank is prohibited.
- C. Oil pipe shall have welded joints except for threaded connections to equipment and valves as required and shown. Provide flanged joints where indicated on Drawings to allow removal of individual components.
- D. Provide butt weld joints for all pipe 1-1/2 inches in diameter and larger and on smaller pipe where specifically indicated on Drawings. Provide socket weld or threaded joints for all piping smaller than 1-1/2 inches in diameter unless indicated otherwise.
- E. Atmospheric piping on top of tank for vents, gauges, instrumentation, etc. shall be galvanized with threaded joints.

## 2.2 TANK FABRICATION

- A. Tank shall be configured as indicated on the Drawings with all connections and appurtenances as indicated.
- B. Tank shall be manufactured in accordance with U.L. Standard 142 or 2085 as specified and provided with third party label.
- C. Tank shell joints to be full penetration butt welds or double welded full fillet lap joints, U.L. 142 Figure 6.1 #2 or #3. Head to shell joints to be full penetration butt welds or double welded full fillet lap joints, U.L. 142 Figure 6.2 #2 or #6.
- D. Tank shall be equipped with integral steel saddle and skid foundation. Saddles to be seal welded to tank - bolt on or strap on saddles will not be accepted. Provide steel "I-Beam" skid foundation of size and weight as indicated on the Drawings. Skids to extend 12" beyond each end of tank and be provided with 4" diameter schedule 80 steel pipe towbar at each end to allow dragging of the tank and lifting from either end. Cut ends of skids at 45 degree angle and cap end with plate of width to match beam flange. Combination saddle and skid foundation to be designed to limit height of tank bottom to 4" maximum above bottom of skids for airplane delivery low-profile tank construction.
- E. Provide with all openings and attachments indicated. Openings indicated as flanges shall be ANSI 150# pattern flanges with raised face except on float switches and emergency vents provide flat faced. Openings indicated as bungs shall be female pipe thread. Provide 1/4" doubler plates where indicated. Flanges shall extend beyond tank shell as dimensioned on drawings.
- F. Install all flanges and bungs plum, level and square to the main axis of the tank in all three planes. Verify bung orientation with pipe nipple. Install flanges with bolt pattern square to tank axes. Piping connections more than one degree out of alignment shall be cut out and re-installed. Verify alignment prior to painting.
- G. Attach all components permanently welded to the tanks including stand-offs. Provide reinforcing plates on all stand-offs and where indicated. . Provide striker plate on tank bottom where indicated. Seal weld all non-structural seams, and round corners and sharp edges prior to sandblasting and painting tank.
- H. Provide with ladder as shown on the drawings. Shop fabricate ladder; verify fit; remove; sandblast and paint equivalent to tank; and band to pallets for shipping. Furnish with all fasteners required for field installation. Fasteners shall be hot dip galvanized.
- I. Prior to assembly, thoroughly coat all threaded pipe joints, flange faces, and bolts with anti-seize compound. Note that this includes temporary shop fit items that are to be removed and temporary coverings for tank openings.
- J. Contractor shall be solely responsible for coordinating with air freight services to confirm that tank dimensions and weights shown on approved shop drawings are compatible with available aircraft for shipping purposes.

## 2.3 APPURTENANCES

- A. All flanges and attachments permanently welded to tank shall not exceed 4" above the top of the tank.

- B. Manholes: 5/16" steel lid (single punch), 1/4" mild steel ring with 7" riser height, nominal size as indicated.
- C. Primary and Secondary Tank Emergency Vents: Aluminum body, flanged connection emergency vent set to open at 16 oz/sq. inch pressure. Emergency vent shall be sized in accordance with UL142. Morrison Bros, Co. Model 244F, with flanged adapter, or approved equal.
- D. Primary Tank Combination Atmospheric Vent/Alarm: Aluminum body and hood, stainless steel screens and float, brass internals, Viton seals. 2" FPT connection, 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., Co Fig 922, or approved equal.
- E. Secondary Tank Atmospheric Vent: Aluminum body, stainless steel screen, FPT connection, size as indicated. Morrison Figure 155 or approved equal.
- F. Gauge Hatch: Brass cap and chain, buna-n gasket, 2" FPT connection. Morrison Figure 307 or approved equal.
- G. Bulk Tank Level Gauge: Aluminum body, 2" FPT connection, vapor tight to 25 PSIG, Stainless steel float sized to pass through 2" pipe, angled display with swivel base, 3 digit readout in feet and inches up to 18 feet. OPW 200TG-AST or approved equal.
- H. Fill Limiters: Float-type mechanical shut-off valve, 2" FPT connection, aluminum body, closed cell buna-n float, brass plunger, stainless steel trim, 100 PSIG shut-off pressure. Morrison Figure 9095-A or approved equal. Provide with 2" aluminum drop tube cut to length at 45 degrees as required to terminate within 6" above tank bottom.

### **PART 3 - EXECUTION**

#### **3.1 SHOP PRESSURE TESTING AND REPORTING**

- A. Pressure test on both the inner tank and the secondary containment in accordance with UL 142 or approved equivalent test method. Notify the Authority in writing a minimum of two (2) days in advance of pressure tests. The Authority shall have the option to be present at all testing. Take photographs of pressure test in progress to document.
- B. Cut out or disassemble all leaking joints. Repair and re-test until system proves leak-free. Retesting after the repair of defects shall be performed at no cost to the Authority.
- C. Submit certified test results along with photographs to the Authority for approval. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification.

#### **3.2 SHOP COATING AND LABELING**

- A. Perform all painting in accordance with manufacturer's instructions including preparation, environmental conditions, and time limits between coats.
- B. Sandblast tank and all components in accordance with SSPC-SP-10 and prime within 4 hours of sandblasting.

- C. Prime with reinforced inorganic zinc primer, Devoe Catha-Coat 302 or approved equal, color green, to 3 mils minimum dry film thickness.
- D. Cover with one coat of epoxy, Devoe Bar-Rust 236 or approved equal, color white, to 6 mils minimum dry film thickness.
- E. Finish with one coat of aliphatic urethane enamel, Devoe Devthane 389 or approved equal, color white, to 3 mils minimum dry film thickness.
- F. Sand smooth all drips and runs. Re-coat any areas not meeting minimum dry film thickness prior to applying next coat. Re-coating shall be performed at no cost to the Authority.
- G. Label tank ends in accordance with the International Fire Code and NFPA 704, including but not limited to product identification, compartment storage capacity, etc.
- H. Label tank connections as indicated on the Drawings with minimum 1" high letters indicating function as listed in parentheses on tank drawings. Provide permanent black vinyl letters or stencil with black polyurethane paint.

### **3.3 SHOP COATING TESTING AND REPORTING**

- A. Perform all surface preparation and coating as specified. Notify the Authority in writing a minimum of two (2) days in advance of application of each coat. The Authority shall have the option to inspect preparation and coating. Take photographs, surface profile measurements, and dry film thickness measurements of tank at each stage prior to beginning next coat.
- B. Submit record of surface profile and dry film thickness measurements along with photographs to the Authority for approval.

### **3.4 FIELD EXAMINATION**

- A. Prior to placement, inspect tank and appurtenances for damage that may have occurred during shipment. Repair damage as required. The Authority will provide final acceptance of tank.

### **3.5 FIELD INSTALLATION**

- A. Site Preparation: Site shall be properly graded to provide drainage of surface water and prevent stagnant water under or around the tank.
- B. Foundation: Concrete footings shall be cured 7 days minimum prior to tank placement. The tank shell shall be maximum 12-inches above finished grade.
- C. Grounding: Tank shall be electrically grounded as indicated on the Drawings.
- D. Testing: Before placing tank in service, conduct on-site air pressure tests on both the inner tank and the secondary containment in accordance with UL 142 or approved equivalent test method.
- E. Connections: Thoroughly coat all threaded pipe joints, flange faces, and bolts with anti-seize compound prior to assembly.
- F. Floats: Thoroughly coat all cable suspended floats with anti-seize compound prior to placing in tank to prevent from freezing to tank bottom.

### **3.6 FIELD TESTING AND STARTUP**

- A. Prior to final installation, verify operation of float switches for correct orientation.
- B. Upon initial fill calibrate manual level gauge and level sensing probe.
- C. Manually open any actuated ball valves and use hand pump to prime piping into power plant day tank. See Section 23 12 13.

**END OF SECTION**

**SECTION 33 61 14**  
**PEX ARCTIC PIPE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Pre-insulated arctic pipe system for not to exceed 200F glycol/water service at 90 psi in direct burial installation. Provide press-fit couplings, adapters, sleeves, shells/couplings, end caps, insulation, shrink sleeves, and all other components required for a complete installation. Heat trace and alarm wires are not required. Install all piping in accordance with manufacturer's instructions.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 21 00 - Thermal Insulation
- B. Section 23 05 00 – Common Work Requirements for Mechanical.
- C. Section 23 21 13 - Hydronic Piping.
- D. Section 31 23 00 - Excavation and Fill.
- E. Section 31 23 33 - Trenching and Backfill For Utilities.
- F. Section 33 61 24 – Steel Arctic Pipe.

**1.3 REFERENCES**

- A. ASTM – American Society for Testing and Materials:
  - 1. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
  - 2. ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
  - 3. ASTM F2080 – Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe.
- B. CSA – Canadian Standards Association:
  - 1. CSA B137.5 – Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
- C. DIN – German Institute for Standardization (Deutsches Institut für Normung):
  - 1. DIN 4726 – Plastic Piping Used in Warm Water Floor Heating (Warmwasser-Fußbodenheizungen und Heizkörperanbindungen - Rohrleitungen aus Kunststoffen).
- D. ISO – International Organization for Standardization:
  - 1. ISO 9001 – Quality Management Systems – Requirements.
- E. ISO – International Organization for Standardization:
  - 1. ISO 9001 – Quality Management Systems – Requirements.
- F. PPI – Plastic Pipe Institute

1. PPI TR-3 – Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

#### **1.4 SYSTEM DESCRIPTION**

- A. PEX to be designated as PEXa and be manufactured by the high-pressure peroxide (Engel) method.
- B. Provide fittings where required and as indicated on the drawings.

#### **1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
  1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information, specifications, and installation instructions.
  2. Joint Kits: Submit manufacturers catalog information, specifications, and installation instructions.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Division 1 - Closeout Requirements.
- B. Project Record Documents: Record actual locations of piping

#### **1.7 QUALITY ASSURANCE**

- A. Division 1 – Quality Control
- B. Install and test products in accordance with manufacturer’s installation instructions, including storage and handling, installing pipe, fittings, and accessories, building entries, field insulation kits, and testing.

#### **1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Fabricator or Installer: Company specializing in performing Work of this section.

#### **1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Division 1 - Material and Equipment: Transportation and Handling.
- B. Deliver pipe in banded coils cut to the length required. The coils shall remain strapped or banded while in storage and should not be uncoiled until time of installation.
- C. Accept materials on site with labeling in place. Inspect for damage.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation. Maximum accumulated UV exposure to not exceed one year for outer jacket.

- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to installation.

### **1.11 WARRANTY**

- A. Division 1 - Closeout Requirements: Warranties.
- B. The pipe manufacturer shall warrant the crosslinked polyethylene carrier pipe to be free from defects in material and workmanship for a period of twenty-five (25) years.

## **PART 2 - PRODUCTS**

### **2.1 CARRIER PIPE**

- A. Crosslinked polyethylene (PEX) carrier pipe shall conform to the requirements of one or more of the following: ASTM F876, ISO 15875 or DIN 16892 and/or DIN 16893. PEX carrier pipe shall have a minimum degree of crosslinking of 70% when tested in accordance with ASTM D2765, Method B
- B. Oxygen Diffusion Barrier: Coextruded barrier layer that limits oxygen diffusion through the PEX carrier pipe to less than 0.32 mg/(m<sup>2</sup>\*day) at 40°C temperature, as defined by DIN 4726, shall be applied to the PEX carrier pipe.

### **2.2 INSULATED PIPE SYSTEM**

- A. Provide single carrier pipe, diameter as indicated. Continuous corrugated seamless polyethylene outer jacket. Foamed in place polyurethane insulation (0.015 btu/hr-ft-f). Insulation to completely fill the annular space between the carrier pipe and jacket to create a fully bonded system that will expand and contract as a unit. Rehau Insulplex, Perma-Pipe PEX-Gard, Rovanco Rhinoflex or approved equal.

### **2.3 JOINT KITS**

- A. Tees, elbows, couplings and sleeves to be hot forged brass or cast bronze. Weld end adapters to be carbon steel. All connections to be with press-fit compression fittings except where indicated as welded. Threaded or bolted compression fittings will not be accepted. Rehau, Perma-Pipe, Rovanco or approved equal.
- B. Straight and tee joint kits to include polyethylene shells and Canusa HDPE (or equal) shrink casings to form a continuous watertight jacket. Insulation to be flexible closed cell foam sheets or rigid urethane foam half shells. Note that two-part pour-in-place urethane foam will not be accepted.
- C. Provide complete joint insulation kits including all required attachments, sealing rings, heat shrink tape, etc. required for installation.
- D. Kits at reducing tees and at PEX to steel connections to allow for outside diameter (O.D.) variations. Any difference in O.D. between pipe, fittings and joint kits must not exceed the allowable shrink tolerance of the supplied heat shrink casing.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Division 1 – Work Covered by Contract Documents: Coordination.

#### **3.2 PREPARATION**

- A. Remove debris and dirt on inside and outside before assembly.
- B. Keep open ends of pipe free from debris and dirt. Protect open ends with temporary plugs or caps.

#### **3.3 EXCAVATION AND BACKFILL**

- A. Perform all excavation, bedding, and backfill in accordance with Section 31 23 33 - Trenching and Backfill For Utilities.
- B. Bury at depth indicated on the Drawings using specified bedding material.

#### **3.4 INSTALLATION - PIPING SYSTEMS**

- A. Keep open ends of pipe free from debris and dirt. Protect open ends with temporary plugs or caps.
- B. Install piping to allow for expansion and contraction and for differential ground movement without stressing pipe, joints, or connected equipment.
- C. Install insulation joint kits in accordance with manufacturer's instructions to create a waterproof casing.
- D. Install continuous rigid insulation over arctic pipe as indicated on the Drawings.
- E. Install metallic locator/warning tape over rigid insulation as indicated on the Drawings.

#### **3.5 TESTING**

- A. Pressure test prior to installing joint kits. See Section 23 21 13 - Hydronic Piping.

#### **3.6 SYSTEM START-UP**

- A. See Section 23 21 13 - Hydronic Piping.

**END OF SECTION**

**SECTION 33 61 24**  
**STEEL ARCTIC PIPE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Pre-insulated piping, elbows, and insulation joint kits for exterior above and below grade hydronic piping.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 23 21 13 - Hydronic Piping.
- D. Section 33 61 14 – PEX Arctic Pipe.

**1.3 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
  - 3. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
  - 1. ASTM A53B - Standard Specification for Pipe, Steel, Black and Hot-Dipped.
- C. American Welding Society:
  - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  - 2. AWS D1.1 - Structural Welding Code - Steel.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

**1.4 SYSTEM DESCRIPTION**

- A. Provide flanges and couplings at locations requiring servicing, and as indicated on the drawings.
- B. Provide pipe hangers and supports in accordance with Drawings and specifications.

**1.5 SUBMITTALS**

- A. Provide submittals for all products and systems under this Section in accordance with Section 23 05 00 - Common Work Results for Mechanical and Division 1.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Joint Kits: Submit manufacturers catalog information.

C. Shop Drawings: Submit shop drawings for fabrication of piping sections and fittings.

**1.6 CLOSEOUT SUBMITTALS**

A. Division 1 - Closeout Requirements.

**1.7 QUALITY ASSURANCE**

A. Division 1 – Quality Control

- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

**1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Fabricator or Installer: Company specializing in performing Work of this section.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Division 1 - Material and Equipment: Transportation and Handling.
- B. Accept materials on site with labeling in place. Inspect for damage.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

**1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

**PART 2 - PRODUCTS**

**2.1 CARRIER PIPE**

- A. ASTM A53B, ERW black steel, Schedule 40, with nominal 1.5" polyurethane insulation and HDPE jacket, Perma-Pipe Xtru-Therm, Rovanco, or approved equal.
- B. Pre-fabricated elbows, tees, and Z-bends to be equivalent construction to straight pipe using ASTM A234 seamless carbon steel butt weld fittings. Standard elbows and tees to have nominal 3' long tangents or as indicated on Drawings.
- C. Make custom fabrications in accordance with details on the Drawings. All field joints to be configured for straight butt welds unless specifically indicated otherwise.

## **2.2 JOINT KITS**

- A. Straight and tee joint kits to include polyethylene shells and Canusa HDPE (or equal) shrink casings to form a continuous watertight jacket. Insulation to be flexible closed cell foam sheets or rigid urethane foam half shells. Note that two-part pour-in-place urethane foam will not be accepted.
- B. Provide complete joint insulation kits including all required attachments, sealing rings, heat shrink tape, etc. required for installation.
- C. Kits at reducing tees and at PEX to steel connections to allow for outside diameter (O.D.) variations. Any difference in O.D. between pipe, fittings and joint kits must not exceed the allowable shrink tolerance of the supplied heat shrink casing.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Division 1 – Work Covered by Contract Documents: Coordination.

### **3.2 PREPARATION**

- A. Remove scale and dirt on inside and outside before assembly and welding.
- B. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### **3.3 INSTALLATION - PIPING SYSTEMS**

- A. Install in accordance with manufacturer's instructions.
- B. Install piping to allow for expansion and contraction and for differential ground movement without stressing pipe, joints, or connected equipment.
- C. Install insulation joint kits in accordance with manufacturer's instructions.

### **3.4 TESTING**

- A. See Section 23 21 13 - Hydronic Piping.

### **3.5 SYSTEM START-UP**

- A. See Section 23 21 13 - Hydronic Piping.

**END OF SECTION**

**SECTION 33 71 01**  
**OVERHEAD ELECTRICAL DISTRIBUTION**

**PART 1 - GENERAL**

**1.01 SCOPE**

- A. This Specification describes the minimum acceptable standards for overhead distribution line construction. All construction work shall be done in a thorough and workmanlike manner in accordance with the Drawings, Staking Sheets, or specifications, and the standards specified herein.
- B. Any modified RUS Construction Units or any new construction units are included on the detail sheets in the Drawings. Any standard RUS Construction Units referenced on the Drawings or Staking Sheets shall be obtained by the Contractor. The lack of having the correct RUS construction unit drawing will not be acceptable as an excuse for an incorrect installation.
- C. The Drawings, Specifications, and Staking Sheets are complementary; what is shown on one is as binding as if called for in all. Do not scale the drawings. Locations of devices and equipment are approximate unless dimensioned.

**1.02 RELATED REQUIREMENTS**

- A. Division 1.
- B. Division 33 Specifications.

**1.03 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 editions of the following specifically noted requirements:
  - 1. ANSI-C2, National Electrical Safety Code – NESC.
  - 2. RUS Bulletin 1728F-804, Specifications and Drawings for 12.47/7.2 kV Line Construction, the Staking Sheets, Drawings and Specification, and Construction Drawings.

**1.04 QUALITY CONTROL**

- A. All material shall be Rural Utility Service (RUS) approved and accepted.
- B. All construction work shall be done in a thorough and workman-like manner in accordance with RUS Bulletin 1728F-804, Specifications and Drawings for 12.47/7.2 kV Line Construction, the Staking Sheets, Drawings and

Specification, and Construction Drawings. The Contractor shall obtain a copy of these specifications and shall keep them on the jobsite.

- C. This specification supplements the RUS Bulletins identified above. Where there is a conflict, the more stringent condition shall apply. In general, standard RUS construction unit drawings have been used. However, several construction units have been modified. These construction units are included on the Drawings and have been identified with a modifier and shall be used in lieu of the similar RUS construction unit.
- D. Work shall be performed to the latest adopted Edition of the National Electric Safety Code (NESC) except where local regulations or the specifications or Drawings are more stringent, in which case the specifications and/or Drawings and the local regulations shall govern.

### **1.05 SUBMITTALS**

- A. Shop Drawings and Product Data: Provide in accordance with Section 33 05 00 - Common Work Results for Utilities and Division 1.
- B. In addition to Product Data the Contractor shall submit the sag and tension method to be used and the associated sag tables.

### **1.06 DISTRIBUTING POLES**

- A. In distributing the poles, large, choice, close-grained poles shall be used for transformers, deadend, angle, and corner poles.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Products shall conform to the following requirements. Items of the same classification shall be identical including equipment, assemblies, parts, and components.
- B. Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacturer of the product.

### **2.02 INSULATORS**

- A. Post or pin insulators shall be rated minimum 23 kV, polymer. Contractor shall determine neck size for the conductor provided.
- B. Suspension insulators shall be polymer, 25 kV Hubbell type PDI-25, or approved equal.

- C. Insulators, tension, pin, and spool, shall be polymer type. Insulators shall be selected to properly accommodate the armor rod installed on the conductor.
- D. All insulators shall be RUS approved.

### **2.03 CROSSARMS**

- A. Crossarms shall meet the requirements of RUS Spec. No. DT-5B:PE-16 solid wood, distribution type, and a 1/4 inch, 45° chamfer on all top edges. Crossarms shall be full-length pressure treated using a pressure injection method approved by the Western Wood Preserves Institute. Pressure treatment shall be by the Copper Naphthenate or pentachlorophenol process in accordance with AWPAC4. Other treatment processes will not be accepted.
- B. Crossarm gains shall meet ANSI C135.33 requirements.
- C. Crossarms shall be 8 feet in length, unless otherwise required by the Contract Documents. Crossarms shall be machined, chamfered, trimmed, and bored for stud and bolt holes before pressure treatment. Factory drilling shall be provided for pole and brace mounting, for four pin or four vertical line-post insulators, and for four suspension insulators, except where otherwise indicated or required. Drilling shall provide required climbing space and wire clearances. Crossarms shall be straight and free of twists to within 1/10-inch per foot of length. Bend or twist shall be in one direction only. Crossarms shall have a stamp or nameplate indicating manufacturer, year of manufacture, species of wood, and type of treatment, and grade (close grain or dense).
- D. Crossarm braces shall be selected for the crossarm length and shall be full-length pressure treated using a pressure injection method approved by the Western Wood Preserves Institute. Pressure treatment shall be by the Copper Naphthenate or pentachlorophenol process in accordance with AWPAC4. Other treatment processes will not be accepted.

### **2.04 FUSED CUTOUTS**

- A. Primary-fuse cutouts shall be 15 kV, 110 kV BIL, 100A loadbreak open type construction, polymer. NEMA B, heavy duty, 10 kA, for crossarm mounting. Open-link cutouts are not acceptable. Fuses shall be the dropout type. Fuse cutouts shall be equipped with combination mounting brackets for cutout and surge arrester, suitable for the indicated installations.
- B. Hubbell Power Systems or equal.
- C. Arresters shall be 7.65 kV, 9 kV duty cycle, distribution class, MOV type requiring no gap adjustment.

- D. Surge arresters shall be provided for protection of aerial-to-underground transitions, gang-operated load-interrupter switches, transformers and other indicated equipment.
- E. Surge arrestors shall meet NEMA LA1 requirements for the zinc-oxide type and shall be suitable for outdoor installations. Arresters shall be equipped with mounting brackets suitable for the indicated installations.
- F. Hubbell PDV-100, no. 213708, or approved equal.

## **2.05 POLE LINE HARDWARE**

- A. Zinc-coated hardware material shall meet ANSI C135.1, C135.14, C135.17, C135.22, and C135.33 requirements.
- B. Steel hardware material shall meet ASTM A575 and A576 requirements.
- C. All hardware shall be hot-dip galvanized in accordance with ASTM A153.
- D. All curved washers shall be cast ductile iron.

## **2.06 GUY ASSEMBLIES**

- A. Guy material shall be minimum 7 strands, 3/8" nominal diameter, Class A zinc-coated-steel high-strength meeting ASTM A475 requirements, with a minimum breaking strength not less than 10,800 pounds or as indicated on the Drawings.
- B. Guy assemblies, including insulators and attachments, shall provide a strength exceeding the required guy strength. Thimbles or thimble-eyes shall be provided on anchor points. Guy hook guy attachments shall be Hubbell catalog number GH5N, or approved equal.
- C. Holding capacities for down guys shall be based on a lead angle of 45 degrees as indicated. When field conditions prevent indicated lead angles, anchors shall be placed in other locations as approved by the Engineer.
- D. Guy deadends shall be made by using Preformed Line Products Guy-Grip deadend, or Engineer approved equal. Deadends shall be selected to equal or exceed the rating of the RUS unit referenced in the Staking Sheets.

## **2.07 GUY MARKERS**

- A. Guy markers shall be full round, 2-inch by 8 feet long, yellow. Markers shall be made of high density polyethylene with ultra-violet light resistance additives to protect the resin and the color from brittleness and fading. Provide vandal resistant type. Securely clamped to the guy at the bottom and top of the marker.

- B. Install red striped reflective tape on both sides of the guy guard. Install in warm environment to allow for proper adhesion.

## **2.08 SPLICES AND DEADENDS**

- A. All splices shall be full tension automatic type, Fargo GL406A, or approved equal.
- B. Primary deadends shall be clamp type dead end shoe, Hubbell PG46N, or equal. Deadends shall be full tension rated for the conductor.
- C. Secondary and service conductors shall be deadended using Preformed Line Products service grip deadends, suitable for the conductor provided.

## **2.09 POLE NUMBERS**

Pole numbers shall be 2-inch high aluminum embossed with Roman typeface. Attached to pole with aluminum barbed round head nail. Pole numbers shall match the associated location in the Staking Sheet.

## **2.10 POLE REFLECTORS**

Where indicated, install a minimum of 4 reflectors vertically on the pole. Reflectors shall be red, aluminum, 3-inch two hole mounting, acrylic.

## **2.11 SECONDARY OVERHEAD CONDUCTORS**

- A. All secondary conductors shall be overhead service drop, multiplex, aluminum, 600 volt, 75° C rating, polyethylene insulated conductors. For each assembly, provide insulated conductors as indicated and an ACSR concentrically stranded neutral messenger. Conductors shall conform to the following standards.

B-230: Aluminum Wire, 1350-H19 for Electrical Purposes.

B-231: Aluminum Conductors, Concentric-Lay-Stranded.

B-232 Aluminum conductors, Concentric-Lay-Stranded, Coated Steel Reinforced (ACSR).

B-399: Concentric-Lay-Stranded 6201-T81 Aluminum Alloy Conductors.

ICEA S-61-402

- B. Each multiplex cable shall be provided in the sizes indicated in the Staking Sheets or on the Drawings. Cables shall be provided based on the standard Code Word for the specific cable. Cables shall be provided as follows:
1. Duplex Conductors:  
  
Cables utilized for lighting or other 120 volt service. Cable shall consist of one insulated conductor and one neutral.
  2. Triplex Conductors:  
  
Cables utilized for single phase service or other uses as indicated on the Drawings. Cable shall consist of two insulated conductors and one neutral ACSR.
  3. Quadruplex Conductors:  
  
Primarily used for three-phase service. Shall be provided with three insulated conductors and one neutral ACSR. Conductors shall be marked for easy phase identification.

## **2.12 SUPPORT BRACKETS AND TRANSFORMER MOUNTS**

Support mounts for three-phase transformer installations shall be Aluma-form wing cluster mounts, model 3MW-24-M-L. Cluster mounts shall be suitable for the transformers installed.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Materials to be used for construction are designated by one or two lower-case alphabetic characters shown on the Drawings and in the "ITEM" column in the drawing material blocks. For example, "b" designates a steel, pole top pin.
- B. Normally crossarm pins and post-type insulators come equipped with washers and locknuts. Thus, the washers and locknuts for crossarm pins are not tallied in the "QTY" (quantity) columns in the material boxes on the Drawings. However, the crossarm pin washers and locknuts are shown on the Drawings in parenthesis to depict proper construction. If crossarm pins or post type insulators are purchased without washers, locknuts or studs, the quantity totals in the material boxes on the Drawings will need to be adjusted accordingly.
- C. Locknuts shall be installed on all threaded material and hardware in addition to nuts and washers. The threads on installed bolts shall protrude past the lock washers a minimum of one inch but not more than two inches.

### **3.02 SETTING POLES**

- A. All poles shall be direct buried as indicated on the Drawings.
- B. Poles shall be buried a minimum depth of 10% of the pole length plus one (1) foot.
- C. On sloping ground, the depth of the hole shall be measured from the low side of the hole.
- D. Poles shall be set so that alternate crossarm gains face in opposite directions, except at terminals and deadends where the gains of the last two (2) poles shall be on the side facing the terminal or deadend. On unusually long spans, the poles shall be set so that the crossarm comes on the side of the pole away from the long span. Where pole top pins are used, they shall be on the opposite side of the pole from the gain, with the flat side against the pole.
- E. Poles shall be set in alignment and plumb except at corners, terminals, angles, junctions, or other points of strain, where they shall be set and raked against the strain so that the conductors shall be in line. Vertical angle structures (A3, B3, C3) shall be offset from centerline by the length of the insulator string hardware, to prevent adjacent poles from leaning into the angle.
- F. Poles shall be raked against the conductor strain not less than one inch for each ten feet of pole length, but not more than two inches for each ten feet of pole length after conductors are installed at the required tension.
- G. Pole backfill shall be thoroughly tamped the full depth. Excess dirt shall be banked around the pole.

### **3.03 OVERHEAD CONDUCTOR INSTALLATION**

- A. Conductors shall be handled with care. Conductors shall not be tramped on nor run over by vehicles. Each reel shall be examined and the wire shall be inspected for cuts, kinks, or other injuries. Injured portions shall be cut out and the conductors spliced. The conductors shall be pulled over suitable rollers or stringing blocks properly mounted on pole or crossarm if necessary to prevent binding while stringing.
- B. The neutral conductor should be maintained on one side of the pole for tangent construction and for angles not exceeding 30°.
- C. With pin-type insulators the conductors shall be tied in the top groove of the insulator on tangent poles and on the side of the insulator away from the strain at angles. Pin-type insulators shall be tight on the pins and on tangent construction the top groove shall be in line with the conductors after tying in.

- D. For neutral and secondary conductors on poles, insulated brackets (Material Item 'da') may be substituted for the single and double upset bolts on angles of 0° to 5° in locations known to be subject to considerable conductor vibration. All conductors shall be cleaned thoroughly by wire brushing before splicing or the installation of a connector or clamp. A suitable inhibitor shall be used before splicing or applying connectors over aluminum conductor.

### **3.04 SAGGING CONDUCTORS**

- A. Conductors shall be sagged evenly and in accordance with the conductor manufacturers' recommendations. The air temperature at the time and place of sagging shall be determined by a certified etched glass thermometer.
- B. The sag of all conductors after stringing shall be in accordance with the conductor manufacturers' recommendations, except that a maximum increase of three (3) inches of the specified sag in any span will be acceptable. However, under no circumstances will a decrease in the specified sag be allowed.
- C. The conductor shall be tensioned above the initial sag conditions. After bringing conductor to proper sag, deadends shall be secured within 2 hours. Wire shall be tied to insulators within 48 hours.

### **3.05 CONDUCTOR TIES**

- A. All ties used shall be pre-formed type as manufactured by Preformed Line Products and conductors shall be properly attached to insulators using preformed ties.
- B. Conductor ties shall be selected to properly accommodate the armor rod installed on the conductor.

### **3.06 GRADING OF LINE**

When using high poles to clear obstacles such as buildings, foreign wire crossing, railroads, etc., there shall be no upstrain on pin-type insulators in grading the line each way to lower poles.

### **3.07 GUYS AND ANCHORS**

- A. Guys shall be placed before the conductors are strung and shall be attached to the pole per the Specifications for Overhead Distribution Line Construction.
- B. All anchors shall be as indicated on the Drawings and specified herein.
- C. Guys shall be placed before the conductors are strung and shall be attached to the pole as shown in the Drawings.

- D. All anchors and rods shall be in line with the strain and shall be so installed that approximately six inches of the rod remain out of the ground. In cultivated fields or other locations, as deemed necessary, the projection of the anchor rod above the earth may be increased to a maximum of 12 inches to prevent burial of the rod eye. The backfill of all anchor holes must be thoroughly tamped the full depth.
- E. Guy bonding clamps shall be installed in the eyes of all anchor rods. All guys (primary & secondary) shall be effectively grounded according to REA/RUS specifications. On secondary poles, guys shall be bonded to the secondary neutral.

### **3.08 POLE LINE HARDWARE**

- A. A locknut shall be installed with each nut, eye-nut, or other fastener on all bolts or threaded hardware such as insulator pins, upset bolts, double arming bolts, etc.
- B. Suitable washers shall be installed under boltheads and nuts on wood surfaces and elsewhere as required. Washers used on through-bolts and double-arming bolts shall be approximately 2-1/4 inches square and 3/16 inch thick. The diameter of holes in washers shall be the correct standard size for the bolt on which a washer is used. Square curved washers shall be used for down-guy attachments to pole. Washers for use under heads of carriage-bolts shall be of the proper size to fit over square shanks of bolts. Eye bolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to adequately support and protect poles, brackets, crossarms, guy wires, and insulators.
- C. A 3 inch by 3 inch (minimum), square, curved washer (item "d") shall be used abutting the pole when installing primary deadend, neutral deadend and guy assemblies directly to the pole. A 2-1/4 inch (minimum) square washer shall be placed under the shoulder of crossarm insulator pins whose surface area abutting the crossarm is less than 4 square inches.

### **3.09 SPLICES AND DEADENDS**

- A. Conductors shall be spliced and deadended as indicated on the Drawings. There shall be not more than one (1) splice per conductor in any span and splicing sleeves shall be located at least ten (10) feet from the conductor support.
- B. No splices shall be located in grade B crossing spans nor in the adjacent spans.

- C. Splices shall be no closer than 1,000 feet from one another and there shall be no more than three splices per mile in any primary phase or neutral conductor.
- D. Splices shall be installed in accordance with the manufacturer's specifications and recommendations.

### **3.10 TAPS AND JUMPERS**

- A. Jumpers and other leads connected to line conductors shall have sufficient slack to allow free movement of the conductors. Where slack is not indicated, it shall be provided by at least two (2) bends in a vertical plane, or one (1) in a horizontal plane, or the equivalent. In areas where aeolian vibration occurs, special measures to minimize the effects of jumper breaks shall be used as specified.
- B. All aluminum to aluminum connections shall be provided with a Belleville washer.
- C. Jumpers and other leads connected to line conductors shall have sufficient slack to allow free movement of the conductors. Where slack is not shown on the Drawings it will be provided by at least two (2) bends in a vertical plane, or one (1) in a horizontal plane, or the equivalent. In areas where aeolian vibration occurs, special measures to minimize the effects of jumper breaks shall be used as specified.
- D. All leads on equipment such as transformers, etc., shall be a minimum of #4 AWG bare, stranded copper conductors. No. 4 AWG stranded copper conductors shall be used from the primary line to a cutout and from the cutout to the transformer. Provide slack in the jumper to allow for movement in the conductors during windy conditions. Where aluminum jumpers are used, a connection to an unplated bronze terminal shall be made by splicing a short stub of copper to the aluminum jumper using a suitable aluminum compression sleeve.
- E. All primary jumpers shall consist of #2 ACSR, or the size of the conductor.
- F. Pole tap assemblies shall be framed so that the source is on top and the load (tap) is below.
- G. In no case shall pin-type insulators be installed upside down to carry jumpers.

### **3.11 HOT LINE CLAMPS AND CONNECTORS**

- A. Connectors and hot-line clamps suitable for the purpose shall be installed. On all hot-line clamp installations, the clamp and jumper shall be installed so that they are permanently bonded to the load side of the line, allowing the jumper to be de-energized when the clamp is disconnected.

- B. Hot-line clamps shall be used at single phase transformer connections beneath three-phase primary lines and where single phase primary taps or extends from a three-phase primary line. Where a hot line clamp is used install a stirrup clamp suitable for the conductor.
- C. Stirrups shall be aluminum, bolted with tin plated loop. Hubbell Power type AHLS, or approved equal. Size selected to fit the primary conductor and the hot line clamp.
- D. Connections to the main line shall be made with compression solderless connectors. Connectors to equipment shall be made with compression connectors bolted to the equipment pad. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire. Where ground wires are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be utilized.
- E. All conductors shall be cleaned thoroughly by wire brushing before splicing or installing connectors or clamps. A suitable oxidation inhibitor shall be applied before splicing or applying connectors over aluminum conductor.
- F. All insulated secondary to secondary connections shall be made using compression connectors which are already pre-insulated, or parallel groove connectors and plastic covers.
- G. Secondary connections at the polemount transformers shall be made up as indicated on the Drawings. Inhibitor compound shall be used in all mechanical (setscrew) connections.

### **3.12 ARMOR RODS**

- A. Armor rods shall be provided for all ACSR conductors. Armor rods shall be installed at each insulator but will not be required at primary dead-end assemblies if aluminum or aluminum-lined zinc-coated steel clamps are used.
- B. Lengths and methods of fastening armor rods shall be in accordance with the manufacturer's recommendations. All armor rods shall be pre-formed round.
- C. The application of armor rods to the conductor shall be such that the center of the armor rods shall not deviate from the center of the conductor support by more than 2-1/2 inches.

### **3.13 SECONDARIES AND SERVICE DROPS**

- A. Secondary conductors shall be multi-conductor service cable. The conductors shall be sagged in accordance with the manufacturer's recommendations.
- B. Conductors for secondary underbuild on primary lines will be insulated in those instances where prevailing conditions may limit primary span lengths to the extent that covered wires or service cables may be used. Service drops shall be covered wire or service cable.
- C. Secondaries and service drops shall be so installed as not to obstruct climbing space. There shall not be more than one splice per conductor in any span, and splicing sleeves shall be located at least ten feet from the conductor support. Where the same covered conductors or service cables are to be used for the secondary and service drop, they may be installed in one continuous run.
- D. #4 Service drops over 140' in length shall be solidly guyed.
- E. #2 Service drops over 100' in length shall be solidly guyed.
- F. Install a wrap of tape around multi-plex cable at ends, to prevent further unraveling. Where multi-plex cable is open-ended, fold leads back and tape to mainline. Also tape the rough edges of pre-formed grips to protect the insulated leads from abrasion caused by wind vibration.
- G. Secondary cable shall be installed: 16" below existing bare neutral and 4'10" down on poles intended for a future primary tangent or 6'1" down on poles intended for a future primary dead-end.
- H. Where both 240/120 volt 1-phase and a higher voltage (208 or 480 volt) 3-phase secondary are to be installed, the higher voltage circuit shall be attached at least 16" above the lower voltage circuit (up to 4/0 quadruplex over 1/0 triplex, 200' maximum span).

### **3.14 SERVICES**

- A. Service entrance and riser shall be by the customer. Contractor shall install the service drop and make connections to the customer's service entrance conductors at the weatherhead. Contractor shall install service entrance deadend.

### **3.15 TRANSFORMERS**

- A. Polemount transformers shall be installed and grounded according to REA/RUS specifications. Transformers shall have at least two connections from the tank to the multi-grounded neutral conductor.

- B. Insulated trainer brackets (material item "fo") shall be used at pole transformers to secure secondary multiplex cable leads to prevent chafing due to wind movement.
- C. Transformers internally wired for 120 Volt secondary shall be labeled "120V" with reflective tags, 2.5" minimum height.

### **3.16 CROSSARMS**

- A. Crossarms shall be bolted to poles with 5/8-inch through-bolts with square washer with locknut at each end. Bolts shall extend not less than 1/8 inch nor more than 2 inches beyond nuts.
- B. On single crossarm construction, the bolt head shall be installed on the crossarm side of the pole. Single crossarms shall be placed on opposite sides of consecutive poles.
- C. Double crossarms shall be securely held in position as indicated on the RUS Construction Units. Each bolt shall be equipped with square washers with locknuts. Double crossarms shall be provided at dead-ends, and at angles and corners as indicated, to provide adequate vertical and longitudinal strength.
- D. Tangent Arms and Buck Arms: Tangent arms and buck arms shall be set at right angles to lines for straight runs and for angles 45° and greater. Tangent arms shall bisect angles of turns of less than 45°. Dead-end assemblies shall be used for turns where shown. Buckarms shall be installed, as indicated, at corners and junction poles.

### **3.17 BRACES**

- A. Wood braces shall be used for crossarm supports, unless specified otherwise on the Drawings. Braces shall be Hughes Brothers type 2023 or 2045, size as indicated on the RUS Construction Units, or approved equal.
- B. Braces shall be bolted to arms with 3/8-inch carriage bolts with round or square washers with locknuts between boltheads and crossarms, and secured to poles with 1/2-inch by 4-inch lag screws after crossarms are leveled and aligned.

### **3.18 GROUNDING**

- A. The ground wire shall be secured to the pole with copper coated staples. The staples on the ground wire shall be spaced two (2) feet apart except for a distance of eight (8) feet above the ground and eight (8) feet down from the top of the pole where they shall be six (6) inches apart.

- B. Poles with pile foundations shall utilize the pile foundations in place of a ground rod. All poles shall be bonded to the pile, see construction unit for details.
- C. Ground rods shall be driven full length in undisturbed earth in accordance with the Drawings. The top shall be at least 12 inches below the surface of the earth.
- D. All below grade connections shall be made using the exothermic weld metal method.
- E. All equipment shall have at least two (2) connections from the frame, case or tank to the multi-grounded neutral conductor.
- F. The equipment ground, neutral wires, and lightning-protective equipment shall be interconnected and attached to a common ground wire.
- G. Ground wire sizes shall be not smaller than No. 4 AWG copper. All pole grounds shall be solid.
- H. Surge Arrester Grounding: Surge arresters shall be grounded. Ground resistance for distribution-class arresters shall be not more than 5 ohms. Ground wire connections shall be not less than #4 AWG for distribution arresters.
- I. Unless otherwise indicated, neutral conductors shall be grounded at each transformer. Also, neutral conductors shall be grounded at a point not exceeding every third pole.

### **3.19 WOOD POLE STORAGE AND HANDLING**

- A. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI 05.1. Poles shall be stacked on treated skids, so arranged as to support the poles without producing noticeable distortion to any of the poles and to allow free circulation of air. The height of the piles shall be limited so as to avoid damage to poles on the bottom layers. Poles shall be piled and supported in such a manner that all poles are at least 1 foot above general ground level and any vegetation growing thereon. No decayed or decaying wood shall be permitted to remain underneath stored poles.
- B. Handling of wood poles shall be in accordance with ANSI 05.1. Poles shall not be dragged along the ground. Cant hooks, pole tongs, or other tools capable of producing indentations of more than 1 inch in depth shall not be used in handling the poles.

### **3.20 TESTS**

- A. Operating Test: After the installation is completed, the Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to

operate in accordance with the requirements herein. Tests shall be performed in the presence of the AUTHORITY or the AUTHORITY Representative. The AUTHORITY shall be notified no less than 7-days prior to test date. The Contractor shall furnish field transportation, instruments, power, tools and personnel required for the test.

- B. Ground-Resistance Measurements: Ground-resistance measurements shall be taken and certified by the Contractor. Certified test results shall be submitted to the AUTHORITY no less than 5-days prior to energization of the distribution system. No part of the electrical distribution system shall be energized prior to the receipt of written approval from the AUTHORITY of the resistance testing of that system's ground rods and grounding systems. Test reports shall indicate the location of the ground point and grounding system and the resistance and the soil conditions at the time the test was performed. When the building water service is used as a ground or part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142.
- C. Sag and Tension Test
1. The AUTHORITY shall be given no less than 7-days prior notice of the time schedule for stringing conductors or cables serving overhead medium-voltage circuits and reserves the right to witness the procedures used for ascertaining that initial stringing sags and tensions are in compliance with requirements for the applicable loading district and cable weight.
  2. The Contractor shall submit the sag and tension method to be used and the sag tables used to achieve the proper sag. The contractor shall wait a minimum of 2 hours after stringing the conductors to allow the conductors to stabilize prior to conducting the sag and tension tests. The contractor must complete the tests within 36 hours after stringing the conductors to avoid damaging the cable. Sagging operations shall not be conducted when wind conditions prevent satisfactory sagging.
  3. The span used to set the sag shall be called the sag-check span. The sag-check span shall be a level span and approximately equal to the ruling span.

**END OF SECTION**

## **SECTION 33 71 02**

### **UNDERGROUND ELECTRICAL DISTRIBUTION**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE**

- A. This Specification provides for the construction of underground power distribution systems. All construction work shall be done in a thorough and workmanlike manner in accordance with the Drawings, Staking Sheets, or specifications, and the standards specified herein.
- B. Any modified RUS Construction Units or any new construction units are included on the Drawings. Any standard RUS Construction Units referenced on the Drawings or Staking Sheets shall be obtained by the Contractor. The lack of having the correct RUS construction unit drawing will not be acceptable as an excuse for an incorrect installation.
- C. The Drawings, Specifications, and Staking Sheets are complementary; what is shown on one is as binding as if called for in all. Do not scale the drawings. Locations of devices and equipment are approximate unless dimensioned.
- D. The electric utility is the City of Nikolai for Nikolai and Venetie Village Electric for Venetie, herein after referred to as the electric utility or utility.

##### **1.2 RELATED SECTIONS**

- A. Division 1 Specifications.
- B. Division 33 Specifications.
- C. Section 31 23 00 – Excavation and Fill
- D. Section 31 23 33 – Trenching and Backfill for Utilities

##### **1.3 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 editions of the following specifically noted requirements:
  - 1. ANSI-C2, National Electrical Safety Code – NESC.
  - 2. RUS Bulletin 1728F-806 (RD-GD-2018-93), Specifications and Drawings for Underground Electric Distribution.

##### **1.4 QUALITY CONTROL**

- A. All material shall be Rural Utility Service (RUS) approved and accepted.
- B. All construction work shall be done in a thorough and workman-like manner in accordance with the latest adopted edition of ANSI C2, National Electric Safety Code (NESC), RUS Bulletin 1728F-806 (RD-GD-2018-93), Specifications and Drawings for Underground Electric Distribution, the Specifications, Drawings, and local regulations. The Contractor shall

obtain a copy of these specifications and shall keep them on the jobsite at all times.

- C. This specification supplements the references identified above. Where there is a conflict, the more stringent condition shall apply. In general, standard RUS construction unit drawings shall be used. Modified construction units may be included on the Drawings and be identified with a modifier.

## 1.5 SUBMITTALS

- A. Shop Drawings and Product Data: Provide in accordance with Section 33 05 00 - Common Work Results for Utilities and Division 1.
- B. Product Data: Submit product data in accordance with contract requirements. At a minimum, submit the following:
1. Primary cable.
  2. Primary load break terminations.
  - ~~3. Primary load break surge arrestors.~~
  - ~~4.3.~~ Cold shrink for sealing HDPE duct.
  - ~~5.4.~~ Schedule 80 PVC conduit, fittings, and elbows.
  - ~~6.5.~~ Schedule 40 HDPE conduit, fittings, and elbows.
  - ~~7.6.~~ Liquid tight flexible non-metallic conduit and fittings.
  - ~~8.7.~~ Conduit supports.
  - ~~9.8.~~ Hardware.
  - ~~10.9.~~ Primary sectionalizing cabinet and extensions.
  - ~~11.10.~~ Primary sectionalizing cabinet marker.
  - ~~12.11.~~ Transformer ground sleeves.
  - ~~13.12.~~ Grounding material.
  - ~~14.13.~~ Cable route marking tape.
  - ~~15.14.~~ Cable route markers.
  - ~~16.15.~~ Equipment identification labels.
  - ~~17.16.~~ Cable marking labels.
  - ~~18.17.~~ Warning signs.
  - ~~19.18.~~ Padlocks.
  - ~~20.19.~~ Cable pulling lubricant.

## 1.6 INSPECTION AND INVENTORY OF BURIED UNITS

Before any backfilling operations are begun, the Contractor and electric utility, or the Authority, shall jointly inspect all trenches, cable placement, risers, pedestals, and other construction not accessible after backfill and an inventory of units shall

be taken. If corrections are required, a second inspection shall be made after completion of the changes.

## 1.7 STORAGE OF MATERIAL AND EQUIPMENT

All material and equipment to be used in construction shall be stored so as to be protected from deteriorating effects of the elements. If outdoor storage cannot be avoided, the material and equipment shall be stacked on supports well above the ground line and protected from the elements as appropriate, and with due regard to public safety.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Products shall conform to the following requirements. Items of the same classification shall be identical including equipment, assemblies, parts, and components.
- B. Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacturer of the product.
- C. All hardware and fasteners shall be stainless steel.

### 2.2 PRIMARY LOAD BREAK TERMINATIONS

Primary cable terminations in sectionalizing cabinets, transformers, and other pad mounted equipment shall be made using 200 amp load break separable connectors meeting the following requirements. The primary separable connectors shall be an assembly of load break elbows, load break feed through inserts, load break junctions, insulated standoff bushings, and load break protective caps, ~~and surge arresters~~.

- A. Meets the latest editions of the following standards:
  - 1. IEEE Std 386 standard for Separable Connectors.
  - 2. IEEE Std 404 standard for Cable Joints and Splices
  - 3. ANSI C119.4 Standard for Copper and Aluminum Conductor Connectors.
  - 4. AEIC CS5, CS6 and CS8 Standards for EPR Insulated Cables.
  - 5. ICEA S-94-649 Standard for EPR Insulated Cables
- B. Has the following voltage ratings and characteristics:
  - 1. Standard Voltage Class: 15 kV.
  - 2. Maximum Phase to Ground: 8.7 kV.
  - 3. AC 60 Hz 1 Minute Withstand: 35 kV.
  - 4. BIL and Full Wave Crest: 110 kV.
  - 5. Continuous current rating of 200 amps.

- C. Load break elbows shall be provided with a sheath seal to seal the junction between the cable and the load break elbow. Provide either a 3M Sheath Seal Kit 5831 or an integral jacket seal.
- D. Load break junctions shall be provided with U-straps.
- E. Load break elbows and surge arresters shall be provided with a test point and hold down bail.
- F. Insulated standoff bushings shall be provided with a stainless steel bracket.

### ~~2.3~~ PRIMARY LOAD BREAK SURGE ARRESTERS

~~Load break surge arresters shall meet the following requirements:~~

~~0. Metal oxide varistor elbow.~~

~~0. IEEE Std. C62.11, Standard, Metal Oxide Surge Arresters for AC Power Circuits.~~

~~0. Shielded dead front.~~

~~0. Suitable for use on 200 amp load break interfaces.~~

~~0. 9 kV MCOV, 7.65 kV.~~

### ~~2.102.3~~ PRIMARY SECTIONALIZING CABINETS

Sectionalizing cabinets shall be of fiberglass construction and shall meet the following requirements.

- A. Single or three-phase as required for the installation or indicated on the Drawings or Staking Sheets.
- B. Dimensions as follows:
  - 1. Three-phase cabinet shall be Nordic Fiberglass ND-552454, with 18" Extension, or approved equal.
  - 2. Single-phase cabinet shall be Nordic Fiberglass ND-362436, with 18" Extension, or approved equal.
- C. Lid shall open wide to allow easy access to junctions from the top and sides.
- D. Direct burial type incorporating a wide base flange.
- E. Produced from fire-retardant resin and a combination of chopped glass spray-up and hand lay-up using woven roving glass reinforcement.
- F. All hardware shall be stainless steel. Provide stainless steel or silicon bronze penta-head bolt. Provide provisions for pad locking.
- G. Extra heavy duty fiberglass construction. Provide a combination of chopped glass spray-up and hand lay-up woven roving glass reinforcement. Provide a smooth exterior finish with marine grade gel coat. Provide external ribs molded into the front, back and sides to provide side-wall strength.
- H. Mounting plates shall be stainless steel. Three-phase cabinets shall be provided with mounting plates to accommodate up to three 4-point 15 kV load break junctions with U-straps. Single-phase cabinets shall be provided

with a mounting plate to accommodate one 4-point 15 kV load break junctions with U-straps. Three-phase cabinets shall be provided with six stainless steel parking stands above the mounting plates. Single-phase cabinets shall be provided with two stainless steel parking stands above the mounting plate.

- I. Provide 3/8" solid copper grounding system.
- J. The exterior shall be covered with Munsell green gel-coat, containing UV stabilizer, and providing superior weather-ability and resistance to ultraviolet attack.
- K. Meet ANSI C57.12.28 Pad-Mounted Enclosure Integrity Standard.

#### **2.112.4 PRIMARY CABLE IN CONDUIT**

All medium voltage conductors shall meet the following requirements:

- A. Voltage Rating: 15 kV.
- B. Acceptable manufacturers:
  - 1. Okonite.
  - 2. Cablec Corporation.
  - 3. Southwire.
  - 4. Approved equal.
- B. Medium voltage cable shall be suitable for primary underground distribution systems installed in underground ducts or conduits.
- C. Medium voltage cable shall meet the following standards.
  - 1. AEIC CS6.
  - 2. ASTM B-3, "Standard Specification for Soft or Annealed Copper Wires".
  - 3. ASTM B-496, "Standard Specification for Compact Round Concentric Lay-Stranded Copper Conductors".
  - 4. IEEE 48 Test procedures and requirements for high voltage alternating current cable terminations.
  - 5. IEEE 386 Separable insulated connector systems for power distribution systems above 600 volts.
  - 6. IEEE 404 Cable joints for use with extruded dielectric cable rated 5000 volts through 46,000 volts and cable joints for use with laminated dielectric cable rated 2,500 volt through 500,000 volt
  - 7. IEEE 592 Exposed semi-conducting shields on pre-molded high voltage cable joints and separable insulated connectors.

8. ICEA S-68-516.
  9. UL 1072 Medium-Voltage Power Cables.
  10. NFPA 70 National Electric Code (NEC).
  11. NEMA WC 8 Ethylene-propylene-rubber insulated wire and cable for the transmission and distribution of electric energy.
  12. RUS U-1
- D. Conductor temperature Ratings:
1. Continuous Operation: 105°C.
  2. Emergency Operation: 140°C.
  3. Short Circuit Rating: 250°C.
- E. Cable shall have both conductor and insulation shielding and shall have a polyethylene jacket. Cable shall conform to NEMA WC8 for ethylene-propylene-rubber insulation. The year of manufacture shall be durably marked on the outer surface of each cable at regular intervals throughout the cable length.
- F. Conductor: Concentric-lay, strand filled, compressed bare aluminum, Class B stranded.
- G. Strand Fill: Provide water swellable powder that meets or exceeds ICEA T-31-610 water penetration resistance and ANSI/NEMA Class A connectorability requirements.
- H. Strand Screen: Extruded semi-conducting ethylene-propylene rubber.
- I. Insulation: Ethylene-propylene rubber, 133 percent, not less than 220 mils average thickness.
- J. Insulation Screen: Extruded semi-conducting ethylene-propylene rubber.
- K. Concentric bare copper strands to form a fully rated concentric neutral installed over the insulation screen.
- L. Encapsulating Jacket: Non-conducting linear polyethylene, with extruded red stripes, that meets the requirement of ICEA. Red stripes shall be spaced 120° apart. Provide NESC required lightning bolt.
- M. The jacket of each cable shall be provided with markings as required by NEC Article 310.120.
- N. Cable in Conduit: Install single conductor in 2 inch diameter Schedule 40 HDPE conduit meeting the following requirements:
1. Red extruded stripes and NESC lightning bolt.
  2. Wall thickness in accordance with NEMA TC7.
  3. Material in accordance with ASTM D 3350.
  4. Dimensions in accordance with ASTM D 3485.

5. Manufactured in accordance with ASTM F 2160.
1. Wall thickness in accordance with NEMA TC7.
2. Material in accordance with ASTM D 3350.
3. Dimensions in accordance with ASTM D 3485.
4. Manufactured in accordance with ASTM F 2160.

#### **2.122.5 CABLE ROUTE MARKER**

- A. Provide buried cable route markers as indicated in Section 3.19.
- B. Cable route markers shall be minimum 66 inches high and shall be three-rail hybrid constructed of fiberglass and UV stable plastic.
- C. Cable route markers shall meet the requirements of RUS Construction Unit UM12.
- D. Provide telephone number and utility name on each marker.
- E. Provide ten spare cable route markers to the electric utility at the end of the project.

#### **2.132.6 EQUIPMENT IDENTIFICATION LABELS**

- A. Provide self-adhesive identification tags, minimum 2 inches high, UV stabilized.

#### **2.142.7 TRANSFORMER GROUND SLEEVE**

- A. Transformer ground sleeves shall be provided for each transformer and shall be selected specifically for the transformer installed and to properly support the transformer. Transformer bases shall not extend past the outside of the ground sleeves. Provide molded supports on the top and on the sides to support transformers the weight of the transformers. Provide a window beneath the high and low voltage compartments for cable entry.
- B. Single phase transformer ground sleeves shall be nominal 32 inches high. Three phase transformer ground sleeves shall be nominal 36 inches high. Extend the top of the ground sleeve a minimum of 12 inches above grade.
- C. The ground sleeve shall be manufactured of SMC (Sheet Molding Compound), a thermosetting compound which is pre-mixed with pigments that are molded into the fiberglass and cannot peel. Ground sleeves shall be produced using fire-retardant resin and a combination of chopped glass spray-up and hand lay-up using 18 oz. woven roving glass reinforcement for great strength.
- D. Provide tie-down bracket to hold the transformer in place. All hardware shall be stainless steel.
- E. Nordic Fiberglass, Inc., or approved equal.
- F. Munsell green gel-coat, 7GY3.29/1.5.

### **2.152.8 PADLOCKS**

- A. Provide Sterling Junior brass padlocks, with keys, from Engineering Unlimited, dba Sterling Security Systems, for each sectionalizing cabinet, transformer, and secondary pedestal, whether existing or new, on the project.
- B. Contractor may use temporary locks on the cabinets during construction but shall remove all temporary locks and install the Sterling Junior padlocks on the equipment prior to substantial completion.
- C. Assign the padlocks and keys to the electric utility.
- D. Provide five spare padlocks with keys above the quantity required for all new and existing equipment.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Materials to be used for construction will be designated by one or two lower-case alphabetic characters shown on the Drawings and in the "ITEM" column in the drawing material blocks. For example, "Uhp" designates an elbow termination.

### **3.2 TRANSFORMER INSTALLATION**

- A. Transformers shall be handled carefully to avoid damage to the finish and shall be positioned in accordance with the Drawings or Staking Sheets, and specifications. Only qualified and experienced personnel shall be allowed to make connections and cable terminations.
- B. Extend the top of the ground sleeve a minimum of 12 inches above grade.
- C. At the entrance of the 15 kV CIC into the ground sleeve, cut the HDPE conduit off above the bottom of the ground sleeve and install a cold shrink tubing over the HDPE and the 15 kV primary cable to seal off the HDPE conduit. See detail on Drawings for additional requirements. Cold shrink tubing shall be Scotch 3M series 8429 or approved equal specifically selected to shrink over the HDPE and the outside of the 15 kV primary cable to seal the conduit water tight.

### **3.3 HANDLING OF CABLE**

- A. Cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground, fences or sharp projections. Care shall be exercised to avoid excessive bending of the cable. The ends of the cable shall be sealed at all times against moisture with suitable end caps. Where it is necessary to cut the cable, the ends shall be terminated and or sealed immediately after the cutting operation.

### **3.4 EQUIPMENT PADS**

- A. The site for equipment pads shall be on undisturbed earth adjacent to but not over the trench. The site shall be cleared of all debris and excavated to the specified depth. Gravel, sand or other acceptable self-draining material shall be added to the site and thoroughly compacted.

### 3.5 EQUIPMENT ENCLOSURES

- A. Excavations for sectionalizing cabinets and transformer ground sleeves shall be made so as to disturb the surrounding earth as little as practical. Enclosures shall be installed with side walls plumb. When ground sleeves are of fiber, plastic, or other semi flexible material, backfilling shall be done with covers in place and with careful tamping so as to avoid distortion of the enclosure. When installation is complete, the cover of the enclosure shall not be lower than and not more than two inches higher than the grade specified by the Owner. Soil in the immediate vicinity shall be tamped and sloped away from the enclosure. The excess soil shall be removed from the site or spread evenly over the surface of the ground to the satisfaction of the Owner.

### 3.6 INSTALLATION OF SECTIONALIZING CABINETS

- A. Install cabinets in accordance with the manufacturer's instructions and the requirements of RUS specifications.
- B. Provide a cabinet extension as required for areas where there will be higher than normal snow buildup.
- C. Ground cabinets in accordance with RUS specifications.
- D. Install a 72" spring loaded cabinet marker to identify the cabinet location.
- E. Install four point load break junctions on each mounting plate.
- F. All unused junction bushings and standoff bushings shall be provided with a load break protection cap.
- G. Primary cables in three-phase sectionalizing cabinets shall be installed with A-phase on the left, B-phase center, and C-phase on the right, facing the sectionalizing cabinet.
- H. At each three-phase sectionalizing cabinet, each 4-point junction shall be identified with the associated phase using 2" high, self-adhesive letters attached to the enclosure above the junction point. Letters shall be white with an orange background.

~~I. Provide surge arresters as required.~~

- ~~J.I.~~ At the entrance of the 15 kV CIC into the ground sleeve, cut the HDPE conduit off above the bottom of the ground sleeve and install a cold shrink tubing over the HDPE and the 15 kV primary cable to seal off the HDPE conduit. See detail on Drawings for additional requirements. Cold shrink tubing shall be Scotch 3M series 8429 or approved equal specifically selected to shrink over the HDPE and the outside of the 15 kV primary cable to seal the conduit water tight.

### 3.7 IDENTIFICATION OF EQUIPMENT

- A. Each sectionalizing cabinet, transformer, and secondary pedestal shall be provided with an identification number. The identification number shall be

located on the outside front of the equipment. The number shall match the number or location shown on the Drawings and Staking Sheets.

- B. Where existing equipment is already provided with identification, remove the existing identification in its entirety and install the new identification as shown on the Drawings and Staking Sheets.

### **3.8 TRENCHING FOR ELECTRICAL DISTRIBUTION**

- A. Perform all excavation, bedding, and backfill in accordance with Section 31 23 33 - Trenching and Backfill For Utilities.
- B. Bury at depth indicated on the Drawings using specified bedding material.
- C. Where electrical distribution is installed in a common trench with other utilities maintain 12" minimum separation.

### **3.9 INSTALLING CABLE**

- A. The cable shall be placed in the trench as soon after the trenching operation as feasible. Wherever possible, cable shall be played out from the reel mounted on a moving vehicle or trailer. The reel shall be supported so that it can turn easily without undue strain on the cable. The cable shall be carefully placed in the trench by hand. All cable placement shall be done under constant supervision to be certain that no damage to the cable occurs.
- B. The cable shall be inspected carefully by the Contractor as it is removed from the reel in laying operations to be certain that it is free from visible defects. The Authority shall decide upon corrective action when defects are discovered.
- C. Cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground, fences or sharp projections. Care shall be exercised to avoid excessive bending of the cable.
- D. Primary cable installed but which will not be terminated within 24 hours shall be sealed using heat shrink or cold shrink end caps. All sealed ends shall be impervious to water penetration.
- E. The minimum bending radius of primary cable is 12 times the overall diameter of the cable. The minimum bending radius of secondary and service cable is six times the overall diameter of the cable. In all cases the minimum radius specified is measured to the surface of the cable on the inside of the bend. No cable bends shall be made within 6.0 inches, of a cable terminal base.
- F. Where more than one cable is to be placed in a trench, the spacing required by the specifications shall be observed. Care shall be taken that any soil falling into the trench during the laying of the first cables does not reduce the clearances of the last, cable below that specified. Should this occur the excess soil must be removed carefully by hand or with equipment that will not damage the installed cables.
- G. Sufficient slack and in no case less than 24 inches shall be left at all transformer pads and terminal points so that movements of cable after

backfilling will not cause damaging strain on the cable or terminals. Provide cable loops as indicated at sectionalizing pedestals.

### **3.10 CABLE FIELD INSTALLED IN HDPE CONDUIT**

Primary and secondary cable may be field installed in 2" HDPE conduit at Contractor's option. All field installation shall meet the following requirements:

- A. All cables installed in conduits shall be lubricated prior to pulling with an approved pulling lubricant which is compatible with cable materials. Lubricant shall be slow drying and its dried residue shall be nonconductive and noncombustible. Polywater Type J, or approved equal.
- B. Lubricants with a wax-based formula, such as "Yellow 77" or similar product, are not an acceptable lubricant and shall not be used.
- C. Cables shall be pulled through conduits using a rotational eye swivel, which shall be separate from the means of cable attachment.

### **3.11 PRIMARY CABLE TERMINATION**

- A. All primary cable terminations at sectionalizing cabinets and transformers shall be made using prefabricated load break elbows installed in accordance with the manufacturer's instructions.
- B. Terminations shall be suitable for the size and type of cable that they are used with and for the environment in which they will operate. Any indication of misfit, such as a loose or exceptionally tight fit, shall be called to the Owner's attention. The outer conductive surface of the termination shall be bonded to the system neutral.
- C. Load break elbows shall be installed in accordance with the manufacturer's instructions.
- D. The cable shield shall be grounded in accordance with the manufacturer's instructions. Provide jacket seal around the ground braid or shield.
- E. A portable covering or shelter shall be available for use when terminations are being prepared and when prefabricated terminations are being switched. The shelter shall be used as necessary to keep rain, snow and windblown dust off the insulating surfaces of these devices.
- F. Since cleanliness is essential in the preparation and installation of primary cable fittings, care shall be exercised to prevent the transfer of conducting particles from the hands to insulating surfaces. Mating surfaces shall be wiped with a solvent such as denatured alcohol to remove any possible accumulation of dirt, moisture or other conducting materials. A silicone grease should be applied afterwards in accordance with the manufacturer's recommendations. Whenever prefabricated cable devices are opened, the unenergized mating surfaces shall be lubricated with silicone grease before the fittings are reconnected.

### **3.12 CABLE SPLICING**

New cables shall not be spliced.

### **3.13 IDENTIFYING CABLES AT TERMINATION POINT**

- A. All cables shall be provided with permanent cable identification tags as indicated on the Drawings, Staking Sheets, or specifications, or identified by the Authority. Temporary markers may be used during construction but shall be removed prior to substantial completion.
- B. As the cables are laid they shall be identified and tagged. The identification shall be of a permanent type, such as that done with an embossing type tape writer on plastic or corrosion resistant metal tags. The tag shall be securely attached to the cable with stainless steel strap. Paper or cloth tags are not acceptable. Hand marking or lettering is not acceptable.
- C. Cable identification shall be installed on each primary conductor, and each duplex, triplex, or quadruplex secondary conductor. Secondary cables shall be identified at transformers and pedestals. Cable tags shall be white, polyolefin, approximately 2”X1”. Circuit number shall be typed or machine printed in black. Hand marking or lettering is not acceptable. Identification shall consist of the name of the service, or other method that clearly identifies each service, as directed by the electric utility.
- D. All tags shall be easily visible without moving the cable or any other piece of equipment or item. Secure around the cable with black “Ty-wraps.”
- E. Primary cables, both new and existing, shall be identified at every accessible location. Each cable shall be identified with the phase of the conductor.
- F. Primary cables shall be identified with the origination of the circuit using minimum 1” high letters.
- G. Any temporary tag used during construction shall be removed and a permanent tag shall be installed prior to substantial completion.
- H. In addition to other identification, each primary conductor, both new and existing, shall be identified by phase using Scotch 35 marking tape. Provide a minimum of 3-inches of tape at each accessible location. Color identification shall be as follows:
  - 1. Phase A: Red.
  - 2. Phase B: White.
  - 3. Phase C: Blue.

### **3.14 GROUNDING**

- A. All neutral conductors, ground electrodes, and groundable parts of equipment shall be interconnected. All interconnections shall be made as shown or noted on the Drawings or required for a complete and safe system. A copperclad ground rod shall be installed at all equipment locations as shown in the Drawings. At a minimum, ground rods shall be installed at each sectionalizing cabinet, electrical service and other equipment as required by RUS specifications and drawings.

- B. The equipment ground, neutral wires, and lightning-protective equipment shall be interconnected and attached to a common ground wire.
- C. All ground conductors and connectors shall be copper. Aluminum material is not acceptable.
- D. Ground wire sizes, not otherwise indicated, shall be not smaller than No. 4 AWG.
- E. The concentric shield shall be grounded at each sectionalizing cabinet and transformer.
- ~~F. Surge Arrester Grounding: Surge arresters shall be grounded. Ground resistance for distribution class arresters shall be not more than 5 ohms. Ground wire connections shall be not less than #4 AWG for distribution arresters.~~
- ~~G.F.~~ At each existing or new electrical service, install a ground rod as indicated or required on the Drawings. Install new ground rod whether there is an existing ground rod or not. If there is an existing ground rod, connect the existing ground rod to the new ground rod.
- ~~H.G.~~ All buried grounding conductor connections shall be made with exothermic welds.

### 3.15 WARNING SIGNS

- A. Each sectionalizing enclosure shall display a warning sign placed so that it is visible to anyone attempting entry into the enclosure.
- B. Provide signs as required by RUS Unit UM33

### 3.16 CABLE ROUTE MARKERS

- A. Permanent cable route markers shall be installed at all corners and direction changes in the primary cable.
- B. On straight runs, install cable route markers every 200 feet between equipment. Minimum one between enclosures 100 feet apart or more.

### 3.17 PADLOCKS

- A. Prior to substantial completion, the Contractor shall cut and remove all temporary locks or other security devices that may be installed on the electrical equipment and install the new padlocks on the electrical equipment.
- B. Contractor shall turn spare padlocks and keys over to the electric utility prior to substantial completion.

### 3.18 TESTS

- A. Operating Test: After the installation is completed, the Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with the requirements herein. Tests shall be performed in the presence of the Owner or the Owner Representative. The Owner shall be notified no less than 7-days prior to test date. The Contractor

shall furnish field transportation, instruments, power, tools and personnel required for the test.

- B. Ground-Resistance Measurements: Ground-resistance measurements shall be taken and certified by the Contractor. Certified test results shall be submitted to the Owner no less than 5-days prior to energization of the distribution system. No part of the electrical distribution system shall be energized prior to the receipt of written approval from the Owner of the resistance testing of that system's ground rods and grounding systems. Test reports shall indicate the location of the ground point and grounding system and the resistance and the soil conditions at the time the test was performed. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142.

**END OF SECTION**

**SECTION 33 71 11**  
**OVERHEAD DISTRIBUTION CONDUCTORS**

**PART 1 - GENERAL**

**1.01 SCOPE**

- A. This specification describes the minimum acceptable quality of primary conductor. Where there is conflict between this specification and any other specification referred to herein, this specification shall govern.
- B. The specification herein is for the materials, design, fabrication, protective coating, and delivery of Aluminum Conductor Steel Reinforced (ACSR) conductors. This specification also describes the requirements for the design, manufacture, and delivery of the conductor.
- C. Provide sag and tension and stringing tables for each type of conductor provided, based on the conditions specified herein. Submit tables for review.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 00 Common Work Results for Electrical
- B. Section 33 71 00 - Electrical Utilities

**1.03 STANDARDS**

All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following standards.

- ASTM B-230: Aluminum Wire, 1350-H19 for Electrical Purposes
- ASTM B-231: Aluminum Conductors, Concentric-Lay Stranded.
- ASTM B-232: Aluminum Conductors, Concentric-Lay Stranded, Coated Steel Reinforced (ACSR).
- ASTM B-500: ASTM Standard Specification for Metallic Coated Stranded Steel Core for Aluminum Conductors, Steel Reinforced (ACSR).

**1.04 SUBMITTALS**

- A. Shop Drawings and Product Data: Provide in accordance with Section 33 05 00 - Common Work Results for Utilities and Division 1.
- B. Submit Product Data for each conductor type.
- C. Submit sag table and stringing table for each conductor type.

## **PART 2 – PRODUCTS**

### **2.01 CONDUCTOR SPECIFICATIONS (#2 ACSR)**

- A. Conductor for Overhead Distribution.
- |   |              |
|---|--------------|
| 1. CODE WORD:                                     | Sparate      |
| 2. Stranding:                                     | 7/1          |
| 3. Rated Strength (pounds) for overall Conductor: | 3460         |
| 4. Overall Conductor Diameter:                    | 0.325 inches |
| 5. Weight (pounds per 1000 feet):                 | 106.7        |

### **2.02 CONDUCTOR**

- A. The conductors shall be capable of withstanding normal handling incident to manufacture, shipment, and field installation without being deformed or abraded. Such handling includes reeling, lifting and movement of full reels, unreeling, pulling through controlled tension stringing equipment, over stringing sheaves, compression fittings and other standard accessories as required.
1. The conductor shall be Class AA stranding in accordance with Table 1 of ASTM B232.
  2. The conductor size and number of wires shall be as specified herein.
  3. The aluminum wire shall be made of 1350-H19 aluminum alloy in accordance with ASTM B230. The minimum average conductivity of the aluminum shall not be less than 61.2% IACS.
  4. The zinc-coated (galvanized) steel core wire (Class A weight coating) shall be in accordance with ASTM B498. The minimum average conductivity of the steel shall not be less than 8% IACS.
  5. The component conductors shall be made with standard right hand lay.
- B. All tension tests shall meet or exceed ASTM B498, B230, and B232. The surface of the conductors shall remain smooth, free from points, sharp edges, abrasions, or other departures from smoothness that would tend to increase radio interference and corona loss. The conductors shall be free from excessive amounts of grease, metal particles, dirt, or other foreign matter. The conductors shall not deform from the cylindrical form nor shall longitudinal smoothness be affected by strand movement when subjected to tension. Conductor components shall be formed so that there is no slack in the outer layer.

### **PART 3 – EXECUTION**

#### **3.01 TESTING**

The MANUFACTURER shall use a statistically based quality control sampling and testing plan to assure acceptable quality levels. As a minimum, sampling and testing shall be as required by ASTM B230, ASTM B232, and ASTM B498.

#### **3.02 SAG & TENSION AND STRINGING TABLES**

The Contractor shall provide a sag table and stringing table for each conductor based on the following information prior to stringing any conductor. All costs associated with these tables shall be included in the cost of the conductor. Contractor shall submit the sag and stringing table for review.

A. Design Conditions:

1. NESC Heavy Loading District, 130 mph wind.
2. Ruling Span: 225 feet
3. Tension:
  - a. Initial Tension: 15% of Conductor Tensile Strength.
  - b. Final Tension: 25% of Conductor Tensile Strength.
  - c. Maximum Tension: 50% of Conductor Tensile Strength.

B. Creep is not a factor.

C. Stringing table shall provide sag and tensions at spans of 100 feet to 300 feet at a temperature range of -40° F to 100° F.

#### **3.03 CERTIFICATION**

- A. Provide a certificate of compliance, signed by an authorized employee of the MANUFACTURER, that the material shipped meets the requirements of this specification and any supplementary requirements cited in a contract or order under which it was purchased.

**END OF SECTION**

**SECTION 33 71 16**  
**WOOD ELECTRICAL UTILITY POLES**

**PART 1 - GENERAL**

**1.01 SCOPE**

This specification describes the minimum acceptable quality of wood poles. Where there is conflict between this specification and any other specification referred to herein, this specification shall govern. The poles shall be constructed in accordance with these specifications.

**1.02 RELATED REQUIREMENTS**

A. Section 33 71 00 - Electrical Utilities

**1.02 STANDARDS**

All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following standards.

RUS Bulletin 1728F-700: Specification for Wood Poles, Stubs, and Anchor Logs.

ANSI 05.1 Wood Poles - Specifications and Dimensions.

AWPA-C4: Poles - Preservative Treatment by Pressure Processes, American Wood Preservers Association.

**1.03 SUBMITTALS**

A. Shop Drawings and Product Data: Provide in accordance with Section 33 05 00 - Common Work Results for Utilities and Division 1.

**PART 2 – PRODUCTS**

**2.01 WOOD POLES**

A. Wood poles shall meet the requirements of ANSI 05.1 and shall be Douglas Fir drilled and gained in accordance with RUS W1.1G Pole Framing Guide. Wood poles shall have pole markings located 10 feet from pole butts. Other locations will not be acceptable. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. No climbing rungs shall be provided.

B. Poles shall be full length pressure treated using a pressure injection method approved by the Western Wood Preserves Institute that prevents leaching. Pressure treatment shall be by the Copper Naphthenate process in accordance with AWPA C4. Other treatment processes will not be accepted.

- C. Poles exhibiting any of the following defects will not be accepted; cross-breaks (horizontal cracks), catface (scars), compound through checks, decay, double sweep (poles having sweep in two planes), hollow butts or tops, improper framing, plugged holes (other than increment core holes), spike knots or any knot with bark inclusion, and split top.
- D. Checks:
  - 1. Checks (vertical cracks) are permitted in the top of pole except for any check more than 1/8 inch wide and extending down from the top of the pole more than 12 inches and within 30 angular degrees from the axis of the face of pole directly above ground; and any through checks or splits.
  - 2. Through checks or splits in the butt surface of the pole are not permitted.
  - 3. A check is considered to be continuous if it is not separated by at least 1/2 inch of wood. The maximum allowable width and length of any single check are found in Table II "Maximum Allowable Check Dimensions".

**TABLE II. MAXIMUM ALLOWABLE CHECK DIMENSIONS**

<b>LENGTH OF POLE</b>	<b>MAXIMUM WIDTH</b>	<b>MAXIMUM LENGTH</b>
30 feet	1/4 inch	5 inches
35 and 45 feet	5/16 inch	5 inches
50 feet and longer	3/8 inch	8 inches

- E. Knots:
  - 1. The diameter of any single knot or sum of the diameters of all knots shall not exceed the limits of Table II "Limits of Knot Sizes".

**PART 3 – EXECUTION**

**3.01 CERTIFICATION**

- A. Provide a certificate of compliance, signed by an authorized employee of the producer, that the material shipped meets the requirements of this specification and any supplementary requirements cited in a contract or order under which it was purchased.
- B. Provide independent inspection certification.

**END OF SECTION**

## **SECTION 33 73 01**

### **NEW OVERHEAD LIQUID-FILLED TRANSFORMERS**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. This specification covers the electrical and mechanical characteristics of Single-Phase Overhead-Type Distribution Transformers. The transformers shall be designed and constructed in accordance with these specifications. All characteristics, voltage designations and tests shall be in accordance with the latest editions of ANSI Standards C57.12.26 and C57.12.00, except as modified herein.
- B. Transformers shall be designed in accordance with RUS requirements and shall be of new construction.
- C. Transformers shall be suitable for step-down service or step-up service as indicated.
- D. Quantities and ratings shall be as indicated on the Drawings and staking sheets.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 26 05 00 Common Work Results for Electrical
- B. Section 33 71 00 - Electrical Utilities

##### **1.03 STANDARDS**

All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI and NEMA standards.

- C57.12.00: IEEE Standard General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers.
- C57.12.20: Overhead-Type Distribution Transformers, 500 KVA and Smaller: High Voltage, 34500 Volts and Below: Low Voltage, 7970/13800Y Volts and Below.
- C57.12.31 IEEE Standard for Pole Mounted Equipment–Enclosure Integrity
- C57.12.35: Bar Coding for Distribution Transformers.
- C57.12.90: IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.

- C57.12.91: Guide for Loading Mineral-Oil-Immersed Overhead and Pad- Mounted Transformers rated 500 kVA and less with 55°C or 65°C average winding rise.
- NEMA TR-1: Transformers, Regulators, and Reactors.
- NEMA TP-1: Guide for Determining Energy Efficiency for Distribution Transformers
- NEMA TP-3: Standard for Labeling of Distribution Transformer Efficiency.
- DOE: 10 CFR Part 431 – Department of Energy – Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.
- REA: Bulletin 50-37 (D10), Specification for Rural Distribution Transformers (Overhead.)

#### **1.04 SUBMITTALS**

- A. Shop Drawings and Product Data: Provide in accordance with Section 33 05 00 - Common Work Results for Utilities and Division 1.
- B. Submit complete electrical data, mechanical and layout drawings, and wiring and connection diagrams for each type of transformer provided.
- C. Drawings shall indicate the kVA rating, dimensions, transformer impedance, voltage (both primary and secondary), phase of the transformer, and winding connecting.
- D. Provide certified test reports prior to shipment of the transformers. Test reports shall indicate the impedance, no load, and full load loss of each transformer, by serial number, and shall include the transformer efficiency, expressed in percent, of the transformer based on the test procedures specified herein.
- E. Certified test reports shall contain a statement identifying the amount of PCB in the insulating oil.

#### **1.05 WARRANTY**

The failure of any transformer due to defective design, material and/or workmanship within 12 months after being energized or eighteen months after being delivered, whichever comes first, shall be repaired or replaced without cost. Any defect in design, material and/or construction discovered within this period shall be corrected at the manufacturer's expense, either by repair or replacement.

### **PART 2 - PRODUCTS**

#### **2.01 RATINGS**

- A. General:

1. Primary Voltage Rating: 12470/7200 volt, grounded wye.
2. Secondary Voltage Rating: As indicated on the staking sheets.
3. Frequency: 60 Hz.
4. Phase: Single.
5. Impedance:  $1\% \pm 5\%$ .
6. kVA Rating: As indicated on the staking sheets.
7. BIL Rating: 7200/12470Y 95 kV.
8. Temperature Rating: Self-cooled, 65° C above a 30° C ambient.

## 2.02 ACCEPTABLE MANUFACTURERS

Acceptable manufactures shall be as follows. Manufacturers shall be on the RUS approved list.

- A. ABB.
- B. Cooper Power.
- C. Ermco.
- D. G. E. Prolec.
- E. Howard Transformers.
- F. Approved equal.

## 2.03 TRANSFORMER VOLTAGES

- A. Transformer primary voltage shall be 7,200 volts.
- B. Unless otherwise indicated on the Drawings or in the staking sheets, transformer secondary voltages shall be as follows:
  1. Transformers used for single-phase service shall be 120/240 volt.
  2. Transformers used as part of a 120/208 three-phase transformer bank shall be rated 120 volts to provide utilization of the full transformer capacity for 120/208 volt, three-phase service.

## **2.04 TRANSFORMER LOSSES**

Transformer no load and load losses shall be provided with the transformer submittal and shall be guaranteed by the manufacturer. Transformer losses determined by the factory tests on the individual transformers shall be less than 10% greater than the guaranteed bid losses. No individual unit shall be shipped that exceeds guaranteed no load losses by more than 10%.

## **2.04 TRANSFORMER TAPS**

Transformers shall be furnished with full capacity high-voltage taps. The taps shall be +/- 2 - 2½% above and below rated nominal voltage. The tap changer switch shall be an externally operated switch with a hotstick-operable handle. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in IEEE Standard C57.12.20.

## **2.05 HIGH VOLTAGE BUSHINGS AND TERMINALS**

- A. Provide two high voltage bushings. Single bushing transformers will not be acceptable.
- B. The bushing terminals provided shall be tin-plated to accommodate both aluminum and copper conductors. The size of the terminals shall be 5/8”.
- C. The color of the bushings shall match Light Gray Number 70, Munsell Notation 5BG7.0/0.4.
- D. High voltage bushings shall be porcelain.
- E. Provide high voltage bushings rated at 110 kV BIL.

## **2.06 LOW VOLTAGE BUSHINGS AND TERMINALS**

- A. Low voltage bushings shall be provided with the following ratings.
  - 1. 30 kV BIL Rating.
  - 2. 10 kV 60 Hz Dry 1-Minute Withstand Voltage.
  - 3. 6 kV 60 Hz Wet 10 Second Withstand Voltage.
- B. The bushing terminals provided shall be clamp type to accommodate the use of screw bar post connector.
- C. Provide three porcelain bushings on 120/240 volt transformers.
- D. The internal secondary leads shall be permanently embossed with the letters A, B, C, and D per ANSI C57.12.00 and C57.12.20.

## **2.07 PROTECTION**

- A. No overcurrent protection is required. Transformers shall be protected using external fused cutouts installed by others.

## 2.08 CORE AND COIL

- A. Windings shall be copper or aluminum. All windings shall meet the guaranteed temperature rise requirements.
- B. The core and coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum the transformer shall be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper.

## 2.09 TANK

- A. The tank shall include a pressure relief device as a means to relieve pressure in excess of pressure resulting from normal operation. The venting and sealing characteristics shall be as follows.
  - 1. Cracking Pressure: 10-psig  $\pm$  2 psig.
  - 2. Resealing Pressure: 6-psig minimum.
  - 3. Zero leakage from reseal pressure to -8 psig.
  - 4. Flow at 15 psig: 35 SCFM minimum.
- B. The tank coating shall meet all requirements in ANSI C57.12.31 including.
  - 1. Salt Spray Test.
  - 2. Crosshatch Adhesion Test.
  - 3. Humidity Test.
  - 4. Impact Test.
  - 5. Oil Resistance Test.
  - 6. Ultraviolet Accelerated Weathering Test.
  - 7. Abrasion Resistance - Taber Abraser.
- C. The tank provided shall have a recessed tank bottom which offers protection when sliding over rough surfaces.
- D. The tank shall have an internal mark, which indicates the proper oil level per Section 6.2.3 of ANSI C57.12.20.
- E. Permanently stamped secondary leads.
- F. The tank covering, and cover ring loops shall be stainless steel. All hardware shall be stainless steel. A bronze nut shall also be provided to eliminate corrosion problems and avoid galling. Provide a visible cover ground.
- G. Provide a drain/sampling device.

- H. Provide ground connections accepting #8 AWG solid to #2 AWG stranded. Provide a ground strap between the secondary neutral bushing and the transformer tank.
- I. The tank shall include arrester mounting pads, grounding provisions, ANSI support lugs (hanger brackets) and lift lugs. Hanger brackets shall be single.
- J. The tank color shall be ANSI 70 light gray.

## **2.10 INSULATING OIL**

Transformers shall be provided with highly refined inhibited new mineral oil and meet the minimum requirements as specified in Table 1, "Functional Property Requirements," of ASTM D3487 and ANSI C57.106.

## **2.11 NOISE**

Standard transformer sound level shall not exceed the values as calculated per the latest edition of NEMA Publication TR-1.

## **2.12 NAMEPLATES & LABELS**

- A. Diagrammatic nameplate that conforms to the latest edition of ANSI C57.12.00. Impedance of the transformer shall be included on the nameplate. The nameplate shall be etched and black-filled aluminum or stainless steel. Affix to the enclosure with rivets.
- B. In addition to warning labels, provide a label indicating the transformer kVA rating on the front of the transformer, in minimum 2-1/2" black letters.

## **PART 3 - EXECUTION**

### **3.01 TESTING AND LOSSES**

- A. All units shall be tested for the following:
  - 1. No Load (Core) Losses.
  - 2. Load Losses at 85°C and rated current.
  - 3. Percent Impedance at 85°C and rated current.
  - 4. Excitation current (100% voltage) test.
  - 5. Winding resistance measurement tests.
  - 6. Ratio tests using all tap settings.
  - 7. Polarity and phase relation tests.
  - 8. Induced potential tests.
- B. The manufacturer shall provide certification for all design and other tests listed in Table 17 of ANSI C57.12.00 including verification that the design has passed Short Circuit Criteria per ANSI C57.12.00 and C57.12.90.

- C. One PDF copy of the factory certified test report of each test, in IEEE 1388 format, shall be delivered to the Engineer for review and acceptance prior to shipment of the transformers.

### **3.02 SHIPPING**

- A. The transformers shall be packaged to protect them from damage during shipment, handling, and storage.

**END OF SECTION**

## SECTION 33 73 04

### REMANUFACTURED PADMOUNT LIQUID-FILLED TRANSFORMERS

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. This specification covers electrical characteristics and mechanical safety features of mineral-oil immersed, self-cooled, remanufactured padmounted transformers with separable insulated high voltage bushings. All characteristics, voltage designations and tests shall be in accordance with the latest editions of ANSI Standards C57.12.26 and C57.12.00, except as modified herein.
- B. Transformers shall be of the RUS type.
- C. Transformers shall be provided with new windings, and all new hardware.
- D. Only transformer cores that were originally manufactured after 1990 will be acceptable for remanufacturing.
- E. Transformers shall be suitable for step-up or step-down service as indicated on the Drawings.
- F. Transformers shall be provided with ground sleeves as specified herein.

##### 1.2 RELATED REQUIREMENTS

- A. Division 1 Specifications.
- B. Division 33 Specifications.

##### 1.3 STANDARDS

All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI and NEMA standards.

- |           |  |
|-----------|--|
| C57.12.00 | IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.   |
| C57.12.26 | IEEE Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors (34500GrdY/19920 Volts and Below; 2500 kVA and Smaller).                |
| C57.12.28 | Pad-Mounted Equipment - Enclosure Integrity.   |
| C57.12.34 | IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) - High Voltage: 34500GrdY/19920 Volts and Below; Low-Voltage: 480 Volt 2500 kVA and Smaller. |
| C57.12.35 | Bar Coding for Distribution Transformers.  |

C57.12.90	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.
C57.12.91	Guide for Loading Mineral-Oil-Immersed Overhead and Pad-Mounted Transformers rated 500 kVA and less with 55°C or 65°C average winding rise.
NEMA TR-1	Transformers, Regulators, and Reactors.
NEMA TP-1	Guide for Determining Energy Efficiency for Distribution Transformers
NEMA TP-2	Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.
NEMA TP-3	Standard for Labeling of Distribution Transformer Efficiency.
NEMA 260	Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.

#### **1.4 SUBMITTALS**

- A. Shop Drawings and Product Data: Submit shop drawings and product data in accordance with contract requirements. At a minimum, submit the following:
  - 1. Transformers.
  - 2. Transformer ground sleeves.
- B. Submit complete transformer electrical data, mechanical and layout drawings, and wiring and connection diagrams for each type of transformer provided.
- C. Drawings shall indicate the kVA rating, transformer impedance, voltage (both primary and secondary), phase of the transformer, winding connection, and tap changers.
- D. Construction shall not commence until the submittal has been approved by the Authority.
- E. Provide certified test reports prior to shipment of the transformers. Test reports shall indicate the impedance, no load, and full load loss of each transformer, by serial number.
- F. Certified test reports shall contain a statement identifying the amount of PCB in the insulating oil.

#### **1.5 WARRANTY**

The failure of any transformer due to defective design, material and/or workmanship within 12 months after being energized or eighteen months after being delivered, whichever comes first, shall be repaired or replaced without cost. Any defect in design, material and/or construction discovered within this period shall be corrected at the manufacturer's expense, either by repair or replacement.

## **PART 2 – PRODUCTS**

### **2.1 RATINGS**

A. General:

1. Primary Voltage Rating: As indicated on the Drawings.
2. Secondary Voltage Rating: As indicated on the Drawings.
3. Frequency: 60 Hz.
4. Phase: As indicated on the Drawings.
5. Impedance: Maximum 5.75% ± 7.5%.
6. kVA Rating: As indicated on the Drawings.
7. BIL Rating: 7.2/12.47 kV: 95 kV.  
600 Volt and lower: 30 kV.
8. Temperature Rating: Self-cooled, 65° C above a 30° C ambient.

### **2.2 ACCEPTABLE MANUFACTURERS**

Acceptable manufactures shall be as follows.

1. Jerry's Electric.
2. T&R Electric.
3. Approved equal.

### **2.3 TRANSFORMER TAPS**

Transformers shall be furnished with four each 2-1/2% full capacity high-voltage taps, 2 above and 2 below rated nominal voltage. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in Section 4.3 of IEEE Std C57.12.34.

### **2.4 THREE-PHASE TERMINAL ARRANGEMENTS**

- A. Primary bushings shall consist of 200-amp loadbreak inserts in accordance with the following.
1. High voltage bushings shall be installed in the high voltage termination compartment located on the front left of the transformer and requiring access via the low voltage termination compartment on the front right.
  2. The high voltage bushings shall be 15 kV 200A bushing wells with bushing well inserts installed. The bushings shall be externally removable and be supplied with a removable stud.
  3. The transformer shall be provided with six (6) high voltage bushings in accordance Figure 2 dimensions of IEEE Std C57.12.34 standard for loop feed configurations. The bushing heights shall be in accordance with Figure 3 minimum dimensions of IEEE Std C57.12.34 standard.

4. A cable accessory parking stand shall be provided and shall be located such that the separable insulated connectors that are designed for operation after the transformer is in place can be operated with hot-line tools.
- B. Secondary terminals:
1. On three-phase transformers with 600 volt, or less, rated secondary windings the secondary terminals shall be provided with tin-plated spade-type bushings for vertical takeoff. The spacing of the connection holes shall be 1.75" on center, per ANSI C57.12.34 Figure 13a. Provide six connection holes.
- C. On transformers provided with a wye-wye connection, the primary neutral connection shall be brought out as a fully insulated H0 bushing in the primary compartment and the low voltage neutral connection shall be brought out as a fully insulated X0 bushing in the secondary compartment. A single H0/X0 bushing will not be acceptable. Provide each bushing with a removable external ground strap connected to a ground pad.

**2.5 SINGLE-PHASE TERMINAL ARRANGEMENTS**

- A. Primary bushings shall consist of 200-amp loadbreak inserts in accordance with the following.
1. The high voltage bushings provided shall be externally clamped bushing wells suitable for loop feed. These wells shall be removable to allow for field replacement of the bushings without opening the tank.
  2. The bushing configuration shall be per IEEE C57.12.38 Figure 3 for ANSI Type II units.
- B. Secondary terminals:
1. On single-phase transformers, provide threaded stud-type line and neutral terminals per the table below:

<b>kVA Rating</b>	<b>Thread Size</b>	<b>Minimum Length (Inches)</b>
10-75	0.625-11 UNC-2A	1.25

**2.6 PROTECTION**

- A. Bayonet with current limiting fuses. The high-voltage overcurrent protection scheme provided with the transformer shall be an externally removable loadbreak expulsion Bay-O-Net fuse assembly with a flapper valve to minimize oil spillage. The bayonet fuses shall be in series with ELSP under-oil partial-range current-limiting back-up fuses with an interrupting rating of 50,000 RMS symmetrical amperes interrupting with minimum melting current approximately 200% of transformer nameplate rating.
- B. Provide two spare fuses of each type provided.

**2.7 CORE, AND COIL**

- A. Windings shall be copper or aluminum. All windings shall meet with the guaranteed temperature rise requirements.

- B. All gaskets used for air or oil seal shall be replaced.
- C. The core and coil shall be baked to remove any moisture and the transformer will be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper.

## 2.8 ENCLOSURE

- A. The enclosure integrity of the tank and cabinet shall meet the requirements for tamper resistance set forth in ANSI C57.12.28 including but not limited to the pry test, pull test, and wire probe test.
- B. All enclosures shall be thoroughly cleaned and all dents shall be flattened to like new appearance. All rust shall be ground or sanded out. The entire unit shall be repainted.
- C. Enclosures:
  - 1. Three-phase transformers shall be compartmental type with dual compartment and barrier between high and low voltage compartments. The high-voltage and low-voltage compartments, separated by a metal barrier, shall be located side-by-side on one side of the transformer tank. When viewed from the front, the low-voltage compartment shall be on the right. Each compartment shall have a door that is constructed so as to provide access to the high-voltage compartment only after the door to the low-voltage compartment has been opened. There shall be one or more additional fastening devices that must be removed before the high-voltage door can be opened. Where the low-voltage compartment door is of a flat panel design, the compartment door shall have three-point latching with a handle provided for a locking device. Hinge pins and associated barrels shall be constructed of corrosion-resistant material, passivated AISI Type 304L.
  - 2. Single-phase transformers shall be ANSI Type 2 provided with a single lift up door. Door shall be provided with tamper resistant strips.
  - 3. A recessed, captive, silicone bronze or 316 stainless steel penta-head bolt that meets the dimensions per IEEE Std. C57.12.28 standard shall secure all access doors. Handles and doors shall be provided with provisions for padlocking.
  - 4. The compartment depth shall be in accordance with IEEE Std. C57.12.34 standard unless additional depth is specified.
  - 5. All hardware, handles, and hinges shall be 304L stainless steel.
  - 6. Enclosures shall meet ANSI C57.12.28 for enclosure integrity.
- D. The tank base shall be designed to allow skidding or rolling in any direction. Lifting provisions shall consist of four lifting lugs welded to the tank.

## 2.9 PAINTING

- A. The transformer unit shall be painted Munsell 7GY3.29/1.5 green. All parts of the transformer shall be painted.

- B. The tank and cabinet coating shall meet all the requirements of ANSI C56.12.28 including:
1. Salt Spray Test.
  2. Crosshatch Adhesion Test.
  3. Humidity Test.
  4. Impact Test.
  5. Oil Resistance Test
  6. Ultraviolet Accelerated Weathering Test.
  7. Abrasion Resistance - Taber Abraser.

## **2.10 INSULATING OIL**

The dielectric coolant in the transformer shall be highly refined Type II inhibited new mineral oil and meet the minimum requirements as specified in Table 1, "Functional Property Requirements," of ASTM D3487 and ANSI C57.106.

## **2.11 NAMEPLATES & LABELS**

- A. Diagrammatic nameplate that conforms to the latest edition of ANSI C57.12.00. Impedance of the transformer shall be included on the nameplate. The nameplate shall be etched and black-filled aluminum or stainless steel. Affix to the enclosure with rivets.
- B. Safety labels shall be provided with each transformer. Safety labels shall meet the latest edition of NEMA Standard No. 260. Labels shall be made of weather resistant material per the latest edition of NEMA Standard 9.15 and UL969.
- C. In addition to warning labels, provide a label indicating the transformer kVA rating on the front of the transformer, in minimum 2-1/2" black letters.

## **2.12 ACCESSORIES**

Provide the following accessories:

- A. Three-Phase Transformers:
1. Bolted inspection lid on the main tank cover.
  2. 1.0" upper fill plug.
  3. 1.0" drain valve with sampling device in LV compartment.
  4. Tank anchoring.
  5. Automatic pressure relief valve.
  6. Metal drip shield.
  7. Ground provisions per C57.12.34 section 9.11.
  8. Liquid level gauge.
  9. Dial-type thermometer gauge.

10. Pressure vacuum gauge.
  11. 24" deep cabinet.
- B. Single-Phase Transformers:
1. Oil site gauge (glass window with ball float).
  2. 0.5" drain plug in LV compartment.
  3. Upper oil fill plug.
  4. Tank anchoring
  5. Lifting bolts.
  6. Ground pads.

### **2.13 TRANSFORMER GROUND SLEEVE**

- A. Transformer ground sleeves shall be provided for each transformer and shall be selected specifically for the transformer installed to properly support the transformer. Transformer bases shall not extend past the outside of the ground sleeves. Provide molded supports on the top and on the sides to support transformers the weight of the transformers. Provide a window beneath the high and low voltage compartments for cable entry.
- B. Single phase transformer ground sleeves shall be nominal 32 inches high. Three phase transformer ground sleeves shall be nominal 36 inches high.
- C. The ground sleeve shall be manufactured of SMC (Sheet Molding Compound), a thermosetting compound which is pre-mixed with pigments that are molded into the fiberglass and cannot peel. Ground sleeves shall be produced using fire-retardant resin and a combination of chopped glass spray-up and hand lay-up using 18 oz. woven roving glass reinforcement for great strength.
- D. Provide tie-down bracket to hold the transformer in place. All hardware shall be 304 stainless steel.
- E. Munsell green gel-coat, 7GY3.29/1.5.
- F. Nordic Fiberglass Inc., Proglass Inc., or approved equal.

## **PART 3 – EXECUTION**

### **3.1 TESTING AND LOSSES**

- A. All units shall be tested for the following:
1. Transformer Turns Ratio Test.
  2. Polarity and Phase Relation Test.
  3. DC Hypot Test. Performed at Two Times Rated Line Voltage Plus 1000 Volts.
    - a. HV to LV.
    - b. HV to Ground.

- c. LV to Ground.
    - d. Core Loss and Excitation Test.
  - 4. Load and No Load Testing
  - 5. Induced Potential Test at 400 Hertz for 7200 Cycles.
- B. One PDF copy of the factory certified test report of each test, in IEEE 1388 format, shall be delivered to the Authority prior to shipment of the transformers.

### **3.2 SHIPPING**

- A. The equipment shall be packaged to protect it from damage during shipment, handling and storage.
- B. Transformers shall be installed on pallets to allow loading and unloading with a forklift.
- C. Exterior of shipping unit shall carry identification of contents.

**END OF SECTION**