

Project Manual For:

**FFY 19 Diesel Emissions Reduction Act (DERA)
Arctic Village and Chenega Bay Project
Project No. 21098**



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

Advertising Date: March 22, 2021

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DIVISION 00 – Bidding and Contract Requirements (yellow)

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ALASKA ENERGY AUTHORITY

INVITATION TO BID

for Construction Contract

Date March 22, 2021

**FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 21098**

Location of Project: Arctic Village and Chenega Bay, Alaska

Contracting Officer: Lois Lemus

Issuing Office: ALASKA ENERGY AUTHORITY (AUTHORITY)

State Funded []

Federal Aid []

Description of Work: This Denali Commission, Volkswagen, EPA, and State appropriate funded contract is for the replacement of older diesel engines with new Tier 3 marine diesel engines in the communities of Arctic Village and Chenega Bay, Alaska work 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 **\$1,000,000 and \$1,200,000**

All work shall be substantially completed by: **Arctic Village: Aug. 30, 2021, Chenega Bay: Sept. 30, 2021**

Final Completion: **Arctic Village: Sept. 15, 2021 , Chenega Bay: Oct. 15, 2021**

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 **April 13, 2021 at 2:00 pm** local time, **Due to the COVID-19 the bid opening will be conducted telephonically.** Potential bidder may attend telephonically by calling **1-907331-5678**, when prompted enter **490 555 740#**.

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:

Bid for Project:
FFY 19 DERA Arctic Village and Chenega Bay Project
Project Number: 21098

ATTN: Lois Lemus Contracting Officer
Alaska Energy Authority
813 West Northern Lights Blvd.
Anchorage, AK 99503

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 bids** amendments or withdrawals transmitted must be received in the email inbox prior to the scheduled time of bid opening, addressed to **Lois Lemus**, Email: procurement@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) 771-3909

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

Fax: (907) 771-3044

³ All questions relating to design features, constructability, quantities, or other technical aspects of the project and questions concerning bidding procedures should be directed to:

Lois Lemus
Contracting Officer
813 West Northern Lights Blvd.
Anchorage, AK 99503

Phone: (907) 771-3909 Email: llemus@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 **March 31, 2021, 2:00 pm.** **Due to the COVID-19 the pre-bid meeting will be conducted telephonically.** Potential bidder may attend telephonically by calling **1-907-313-5678**, when prompted enter **595 016 677#**. 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 Contracting Officer, Lois Lemus, at (907) 771-3909 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)**

STATE OF ALASKA
ALASKA ENERGY AUTHORITY

EEO-1 CERTIFICATION

Federal- Contracts
FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 21098

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 **March 22, 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

FFY 19 DERA Arctic Village and Chenega Bay Project

Project No. 21098

Located at **Arctic Village and Chenega Bay, 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 by Arctic Village Aug. 1, 2021 Chenega Bay Sept. 1, 2021 after the effective date of Notice to Proceed and to,

Substantially Complete the work by **Arctic Village = Aug. 30, 2021, Chenega Bay= Sept. 30, 2021**

Final Completion: **Arctic Village = Sept. 15, 2021, Chenega Bay = Oct. 15, 2021**

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

**FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 21098**

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 on the basis of the total Base Bid plus additive alternates as selected by Alaska Energy Authority. If Bid Alternates are included in the Bid Documents, the Alaska Energy Authority reserves the right to award some, none, or all of the alternates. Alternates may be awarded in any order in the best interest of the Alaska Energy Authority.

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

Item	Description	Quantity	Unit	Unit Price	Extended Total Amount
BASE BID:					
1	Arctic Village	1	LS	\$	\$
2	Chenega Bay	1	LS	\$	\$
FFY 19 DERA Arctic Village and Chenega Bay Project Total Base Bid:				\$	

Additive Alternates

Item	Description	Quantity	Unit	Unit Price	Extended Total Amount
ALT 1	Additive Alternate 1: Arctic Village	1	LS	\$	\$
ALT 2	Additive Alternate 2: Arctic Village	1	LS	\$	\$
ALT 3	Additive Alternate 1: Chenega Bay	1	LS	\$	\$
ALT 4	Additive Alternate 2: Chenega Bay	1	LS	\$	\$
Total Additive Alternates					

Total Sum of Base Bid and Additive Alternates \$ _____

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

2. Acknowledge all addenda

Addendum No	Date Issued	Addendum No	Date Issued	Addendum No	Date Issued

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

**FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 21098**

DATE BOND EXECUTED: _____

PRINCIPAL (Legal name and business address):

TYPE OF ORGANIZATION:

	<input type="checkbox"/> Individual	<input type="checkbox"/> Partnership
	<input type="checkbox"/> Joint Venture	<input type="checkbox"/> Corporation
STATE OF INCORPORATION:		

SURETY(IES) (Name and business address):

A.	B.	C.
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)

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

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

Surety C	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
FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 2198

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: **Arctic Village: Aug. 30, 2021, Chenega Bay: Sept. 30, 2021**
Final Completion: **Arctic Village: Sept. 15, 2021, Chenega Bay: Oct. 15, 2021**

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

**FFY19 DERA Arctic Village and Chenega Bay Project
Project No. 21098**

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
FFY 19 DERA Arctic Village and Chenega Bay Project
Project No. 21098

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

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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.”

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SECTION 00 80 00
SUPPLEMENTARY CONDITIONS
MODIFICATIONS TO THE GENERAL CONDITIONS

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."

SC-4.7 – SURVEY CONTROL

At General Conditions Article 4.7, delete the section in its entirety.

SC-5.4.1 – INSURANCE REQUIREMENTS

At General Condition Article 5.4.1, delete the second to the last sentence and replace with the following: “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.

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-9.4–CHANGE ORDER

B. At General Conditions Article 9.4, add the following sentence:

"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-11.8–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 expiration of the Contract Time or the completion date has passed, the AUTHORITY shall deduct \$500 from progress payments.

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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.

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."

END OF SECTION 00 80 00

REQUIRED CONTRACT PROVISIONS
For
FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Non-discrimination
- III. Non-segregated Facilities³
- IV. Payment of Predetermined Minimum Wages
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I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the Contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each 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 subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of these Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4, and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. Selection of Labor: During the performance of this contract, the contractor shall not:

- a. discriminate against labor from any other State, possession, or territory of the United States, or
- b. Employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION (Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the Alaska Energy Authority (AEA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the AEA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the AEA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the AEA.

8. Selection of Subcontractors, Procurement of Materials, and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 26 shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from AEA personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years

following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the AEA and the U.S. DOT.

a. The records kept by the contractor shall document the following:

(1) The number of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

(4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the AEA each July for the duration of the project, indicating the number of minority, women, and non minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on the job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES (Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO Provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

2. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, or national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

3. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to the award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGES (Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on

any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

a. The AEA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) The work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) The additional classification is utilized in the area by the construction industry;

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) With respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the U.S. Department of Labor, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days

of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of the U. S. DOL) and Helpers:

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers: Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, which is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. Apprentices and Trainees (Programs of the U.S. DOT): Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and

trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:** The AEA shall, upon its own action or upon written request of an authorized representative of the DOL, withhold or cause to be withheld from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the AEA Procurement Officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. **Overtime Requirements:** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such work week unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. **Violation: Liability for Unpaid Wages; Liquidated Damages:** In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible therefor shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:** The AEA shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS (Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. **Compliance with Copeland Regulations (29 CFR 3):** The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b) (2) (B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish each week in which any contract work is performed a payroll of wages paid each of its employees (including apprentices, trainees, and helpers described in Section IV, paragraphs 4 and 5 and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402 or the Government Bookstore, 915 Second Avenue, Seattle, WA 98174. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance", signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid in full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions set forth in the Regulations, 29 CFR 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this section V available for inspection, copying, or transcription by authorized representatives of the AEA, the U.S. DOT, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the AEA, the U.S. DOT, DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any

further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORDS OF MATERIALS, SUPPLIES, AND LABOR (Applicable to highway contracts)

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR Part 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on the Form FHWA-47.

c. Furnish, upon the completion of the contract, to the AEA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items so performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR Part 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of this Section VII is computed includes the cost of materials and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the AEA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the AEA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the AEA is assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract, the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the AEA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract entered into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous, or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. Title 18, United States Code, Section 1001, states:

“Whoever, in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or makes any false, fictitious or fraudulent statements or representations, or makes or uses any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than five years, or both.” (June 25, 1948, ch. 645, 62 Stat. 749.)

To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all personnel concerned with the project:

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid, or the execution of this contract or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq., as amended by Pub. L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR Part 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the AEA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraphs 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions: (Applicable to all Federal-aid contracts - 49 CFR 29)
 - a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
 - b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
 - c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
 - d. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
 - e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary 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 Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
 - f. The prospective primary participant agrees by submitting this 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 by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that 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 nonprocurement portion of the "Lists of Parties Excluded from Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f 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 other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Covered Transactions: (Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. 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 lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms “covered transaction,” “debarred,” “suspended,” “ineligible,” “primary covered transaction,” “participant,” “person,” “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 Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this 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 by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction,” without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participation in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that 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 Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e 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 other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment,

Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transactions:

1. The prospective lower tier participant certifies, by submission of this 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. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING (Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, 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. 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 U.S.C. 1352. 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.

3. The prospective participant also agrees by submitting his or her bid or proposal 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.

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SECTION 01 11 13
SUMMARY OF WORK

PART 1 – GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Related Requirements.
- B. Work covered by Contract Documents.
- C. Description of Work.
- D. Contract Method.
- E. Work by Others.
- F. Coordination.
- G. Access for Testing and Inspection.

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 – General Conditions.
- B. Section 00 80 00 – Supplementary Conditions.
- C. Section 01 29 73 - Schedule of Values.

1.3 LOCAL DATA AND COMMUNICATION

- A. Work under this Contract requires internet service for testing and reporting and telephone service for progress meetings. Following is a summary of service.
 - a. Arctic Village Internet: A modem will be installed in the power plant control room and internet service will be activated on or before July 1, 2021. The Contractor will be provided access to the internet for project related tasks.
 - b. Arctic Village Telephone: Local cellular phone service is available in the community. The Contractor shall make arrangements as required with the local provider to have active service throughout the duration of work on site.
 - c. Chenega Bay Internet: A modem will be installed in the power plant control room and internet service will be activated on or before July 1, 2021. The Contractor will be provided access to the internet for project related tasks.
 - d. Chenega Bay Telephone: Local cellular phone service is available in the community. The Contractor shall make arrangements as required with the local provider to have active service throughout the duration of work on site.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work under this Contract consists of the upgrade of two each existing electric power generation systems; one for the community of Arctic Village and one for the community of Chenega, herein referred to as Chenega Bay.
1. Item 1: Arctic Village Base Bid: Perform the work described in 1.4 Description of Work below.
 2. Item 2: Chenega Bay Base Bid: Perform the work described in 1.5 Description of Work below.
 3. Item A1: Arctic Village Additive Alternate #1: Perform the work described in 1.6 Description of Work below.
 4. Item A2: Arctic Village Additive Alternate #2: Perform the work described in 1.7 Description of Work below.
 5. Item A3: Chenega Bay Additive Alternate #1: Perform the work described in 1.8 Description of Work below.
 6. Item A4: Chenega Bay Additive Alternate #2: Perform the work described in 1.9 Description of Work below.
- B. 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.

1.5 ARCTIC VILLAGE BASE BID DESCRIPTION OF WORK

- A. Mobilize all required materials, equipment, tools, supplies, etc. and all required personnel to the project site in Arctic Village, AK.
- B. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- C. Remove two existing diesel engine-generator sets (gensets) and associated mechanical and electrical systems as indicated in the Drawings. Take care to avoid damage to existing systems not being demolished and to equipment being salvaged.
- D. Render all existing engine blocks taken out of service unusable by cutting a minimum 3"x3" hole in engine crank case. Fill out a certificate of destruction for each engine and include photographic documentation of the hole and the associated engine nameplate.
- E. Install two new Tier 3 marine diesel engine powered gensets with all ancillary equipment and mechanical and electrical connections as indicated in the Drawings.
- F. Renovate existing switchgear as indicated in the Drawings.
- G. Modify existing plant mechanical and electrical systems as indicated in the Drawings.

- H. Test and commission the completed work. See 1.10 Testing and Commissioning below for a description of tasks.
- I. Upon completion of commissioning clean up the jobsite, remove and dispose of all trash and debris, turn over all salvaged materials to the Owner as indicated in the Drawings, and remove all Contractor tools and equipment from the project site.

1.6 CHENEGA BAY BASE BID DESCRIPTION OF WORK

- A. Mobilize all required materials, equipment, tools, supplies, etc. and all required personnel to the project site in Chenega Bay, AK.
- B. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- C. Remove one existing diesel engine-generator set (genset) and associated mechanical and electrical systems as indicated in the Drawings. Take care to avoid damage to existing systems not being demolished and to equipment being salvaged.
- D. Render all existing engine blocks taken out of service unusable by cutting a minimum 3"x3" hole in engine crank case. Fill out a certificate of destruction for each engine and include photographic documentation of the hole and the associated engine nameplate.
- E. Install two new Tier 3 marine diesel engine powered gensets with all ancillary equipment and mechanical and electrical connections as indicated in the Drawings.
- F. Remove existing switchgear and associated systems as indicated in the Drawings.
- G. Provide new switchgear and associated systems as indicated in the Drawings.
- H. Modify existing plant mechanical and electrical systems as indicated in the Drawings.
- I. Test and commission the completed work. See 1.10 Testing and Commissioning below for a description of tasks.
- J. Upon completion of commissioning clean up the jobsite, remove and dispose of all trash and debris, turn over all salvaged materials to the Owner as indicated in the Drawings, and remove all Contractor tools and equipment from the project site.

1.7 ARCTIC VILLAGE ADDITIVE ALTERNATE #1 DESCRIPTION OF WORK

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Drain, clean, and flush cooling system and charge with new glycol solution as indicated in the Drawings.
- C. Upon completion clean up the jobsite, remove and dispose of all trash and debris, and turn over all salvaged materials to the Owner as indicated in the Drawings.

1.8 ARCTIC VILLAGE ADDITIVE ALTERNATE #2 DESCRIPTION OF WORK

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Remove one existing diesel engine-generator set (genset) and associated mechanical and electrical systems as indicated in the Drawings. Take care to avoid damage to existing systems not being demolished and to equipment being salvaged
- C. Install one new Tier 3 marine diesel engine powered genset with all ancillary equipment and mechanical and electrical connections as indicated in the Drawings.
- D. Renovate existing switchgear as indicated in the Drawings.
- E. Modify existing plant mechanical and electrical systems as indicated in the Drawings.
- F. Test and commission the completed work. See 1.10 Testing and Commissioning below for a description of tasks.
- G. Upon completion clean up the jobsite, remove and dispose of all trash and debris, and turn over all salvaged materials to the Owner as indicated in the Drawings.

1.9 CHENEGA BAY ADDITIVE ALTERNATE #1 DESCRIPTION OF WORK

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Remove existing day tank and associated piping, appurtenances, controls, and accessories as indicated in the Drawings. Drain and purge piping being careful to catch all fluids. Take care to avoid damage to existing systems not being demolished and to equipment being salvaged.
- C. Provide new day tank and associated piping, appurtenances, controls, and accessories and install existing salvaged equipment as indicated in the Drawings.
- D. Functionally test and commission the completed work as indicated in the Drawings.
- E. Upon completion clean up the jobsite, remove and dispose of all trash and debris, and turn over all salvaged materials to the Owner as indicated in the Drawings.

1.10 CHENEGA BAY ADDITIVE ALTERNATE #2 DESCRIPTION OF WORK

- A. Maintain prime power in the community with limited outages scheduled in advance with the local utility.
- B. Remove existing piping and accessories as indicated in the Drawings. Drain and purge piping being careful to catch all fluids.
- C. Provide new actuated ball valves and associated piping, appurtenances, controls, and wiring as indicated in the Drawings.
- D. Functionally test and commission the completed work as indicated in the Drawings.
- E. Upon completion clean up the jobsite, remove and dispose of all trash and debris, and turn over all salvaged materials to the Owner as indicated in the Drawings.

1.11 TESTING AND COMMISSIONING

- A. Testing and Commissioning shall coincide with Substantial Completion. Provide written notice to the Authority in accordance with 01 77 00 Contract Closeout.
- B. Upon approval of submittals, AEA will provide two checklists to the Contractor: one for Substantial Completion and one for Testing and Commissioning.
- C. Prior to the arrival of the Authority for Substantial Completion the Contractor shall:
 - 1. Verify completion of all tests of mechanical and electrical systems as required by the Contract Documents including but not limited to pressure tests, continuity tests, motor rotation, etc. Test reports shall be completed, signed, dated, and shall include photographic documentation.
 - 2. Review the Substantial Completion checklist to confirm that all work is or will be substantially complete prior to testing.
 - 3. Review the Testing and Commissioning checklist to confirm that all materials, equipment, supplies, and personnel required to functionally test all systems are on site and available.
 - 4. Using the Testing and Commissioning checklist as a guide, run generation equipment through preliminary tests to verify it performs the sequences of operations as specified.
- D. The Contractor shall functionally test and commission the completed work in the presence of the Authority or their designee. Tasks shall include but not be limited to:
 - 1. Furnish a minimum 100kW portable load bank with all required cables and connectors to be utilized during functional testing.
 - 2. Functionally test all mechanical and electrical equipment and all associated controls to demonstrate proper operation.
 - 3. Test and calibrate all mechanical and electrical instrumentation devices.
 - 4. Run through a complete functional test of the generation system including automatic and manual start/stop, paralleling, load sharing, demand control, and safety shut downs.
 - 5. Test all data and communication systems including PLC, operator interface screens, and other devices. Demonstrate proper operation of SCADA system on all devices within the plant and also on a remote computer via Ethernet connection.
 - 6. Train local power plant operators in the operation of all new equipment and systems.

1.12 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.

1.13 WORK BY OTHERS

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

1.14 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.

1.15 ACCESS FOR TESTING AND INSPECTION

- A. 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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 and submit to the Authority prior to the start of work. 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

ALASKA ENERGY AUTHORITY	SUBCONTRACTOR CERTIFICATION	 ALASKA ENERGY AUTHORITY
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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: FFY19 DERA Arctic Village & Chenega Bay Upgrades 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 <input type="checkbox"/>	No <input type="checkbox"/>
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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 <input type="checkbox"/>	No <input type="checkbox"/>
--	------------------------------	-----------------------------

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 <input type="checkbox"/>	No <input type="checkbox"/>
--	------------------------------	-----------------------------

8. a. Does the Subcontractor have adequate insurance coverages as specified in the Contract Documents?

	Yes <input type="checkbox"/>	No <input type="checkbox"/>
--	------------------------------	-----------------------------

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 <input type="checkbox"/>	No <input type="checkbox"/>
--	------------------------------	-----------------------------

- b. Does the evidence of insurance certify that the policies described thereon comply with all aspects of the insurance requirements for this project?

	Yes <input type="checkbox"/>	No <input type="checkbox"/>
--	------------------------------	-----------------------------

PROJECT: FFY19 DERA Arctic Village & Chenega Bay Upgrades 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 Notice on a form provided by the Authority. The Authority may respond by rejecting it, or with an RFP to initiate contract change. The Contractor's Change Notice 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: FFY19 DERA Arctic Village & Chenega Bay Upgrades

R.F.I. Number: _____

From: _____

To: Alaska Energy Authority

Date: _____

Re: _____

A/E Project Number: _____

Contract For: _____

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: FFY19 DERA Arctic Village & Chenega Bay Upgrades

Change Order Request Number: _____

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

Project No.: _____

Directive No.: 000

Project Name: FFY20 DERA
Arctic Village & Chenega Bay Upgrades

Contractor: _____

Address: _____

Scope of this Directive

- Commencement of Work
- Suspension of Work
- Contract Non-Conformance
- Contract Clarification

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 CPM 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 CPM 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 33 00 – Submittal Procedures.
- I. Section 01 45 00 – Quality Control.
- J. Section 01 51 00 – Construction Facilities.
- K. Section 01 77 00 – Contract Closeout Procedures.
- L. Section 01 78 39 – Project Record Documents.

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. 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 PRECONSTRUCTION CONFERENCES

- A. The Authority will administer preconstruction conference for execution of Contract and exchange of preliminary submittals. Attendance by all key Contractor and Subcontractor project personnel is required.
- B. 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.

1.4 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.

1.5 PROGRESS MEETINGS

- A. All project meetings will be conducted telephonically unless specifically arranged to be held in person.
- B. The Contractor shall attend Progress Meetings when scheduled by the Project Manager or requested by the Contractor. The minimum frequency will be typically three times per week. 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.
- C. Progress Meeting shall be attended by all key Contractor personnel and, as appropriate, Subcontractor project 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.

1.6 SAFETY MEETING

- A. The Contractor shall conduct Safety Meetings as required by its project Safety Program.
- B. The Contractor shall invite the Authority to attend Safety Meetings.

1.7 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 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 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 (incomplete or improperly submitted submittals count as one of these submittals). 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:

“No Exceptions Taken” – denotes that the submittal is generally consistent with the requirements of the Contract Documents. A resubmittal is not required.

“Approved as 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. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME).
 - 6. American Petroleum Institute (API).

7. American Society of Testing and Materials (ASTM).
8. American Society of Mechanical Engineers (ASME).
9. American Welding Society (AWS).
10. American Institute of Steel Construction (AISC).
11. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
12. Alaska Department of Environmental Conservation (ADEC) 18 AAC 75.
13. Steel Structures Painting Council (SSPC).
14. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.

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.
- B. 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 33 23 – Shop Drawings, Product Data, and Samples.
- D. Section 01 42 19 – Reference Standards.
- E. Section 01 60 00 – Material and Equipment.
- F. Technical Specifications: Contractor and Fabricator Qualifications and Testing.

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

2.1 CONTRACTOR QUALIFICATION TECHNICAL 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.
- B. In accordance with Alaska statues 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. Fabricators for specialty equipment such as engine-generators or switchgear shall meet the minimum requirements of the technical specifications.

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.
 - e. Contractor Deficiency Reports and punch lists as appropriate to the level of completion of the Work.
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 and submit to the Authority the following Quality Control records and reports:
 1. Daily Reports: The Contractor shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. The Daily 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. One copy of each Daily Report shall be submitted to the Authority on a weekly basis.
 2. 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.
 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 the required written reports.
 4. Non-Conformance Report: Contractor shall submit a weekly Non-Conformance Report to the Authority identifying all substandard inspections and tests taken during the week, including identification by Specification section and schedule activity of the inspection or test, location and nature of defects, causes for rejection and remedial actions taken or proposed. The Non-Conformance Report shall also identify corrective actions taken or proposed for any open items on prior Non-Conformance Reports including a scheduled date for resolution of each item. The Non-Conformance Report shall be submitted and discussed in Progress Meetings.

5. Inspection Control Log: Contractor shall maintain an inspection control log chronologically recording each inspection and test performed by the Contractor, including the nature of the inspection, test or retest, the date performed, the results, causes for rejection, remedial action or corrective action taken and dates of subsequent inspections and retests, and final acceptance. The Contractor shall submit the updated Inspection Control Log weekly to the Authority; the Log will be discussed in Progress Meetings.

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 insures 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 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, valves, batteries, 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 60 00 – Material and Equipment.
- I. 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, 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 90 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: FFY19 DERA Arctic Village & Chenega Bay Upgrades

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
 _____ Date: _____
 Rejected
 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, suppliers, 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 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, 2materials 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 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 and the switchgear.
- B. 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

1.9 TRAINING

- A. Before Substantial Completion, instruct the 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, similar to O&M Manual.
- 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. Certificate of Engine Destruction.
 - 2. Required Certificates of Inspection.
 - 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

- 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. Authority 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 may 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: FFY19 DERA Arctic Village & Chenega Bay Upgrades

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:

Date:

Project Manager

U.S. EPA Diesel Emission Reduction Program

Certificate of Engine/Chassis Destruction

EPA Grantee Name: _____ EPA Grant No.: _____

Subgrantee Name: _____

Vehicle Owner Name: _____

Vehicle Owner Address: _____

Old Vehicle/Chassis Information

Make:	_____	Vehicle ID Number:	_____
Model:	_____	Odometer Reading:	_____ miles
Year:	_____		

Old Engine Information

Make:	_____	Horsepower:	_____
Model:	_____	ID or Serial No.:	_____
Year:	_____		

Name of Dismantler: _____

Address of Dismantler: _____

Date Vehicle Accepted by Dismantler: _____

Signature of Dismantler: _____

EPA Grantee/Subgrantee Authorized Representative:

Date engine/chassis disabled: _____

Statement: I certify that within 90 days of replacement, the old engine and chassis (where applicable) have been permanently disabled. Disabling the engine consists of cutting, drilling, or punching a three inch by three inch (3" x 3") hole in the engine block. Disabling the chassis consists of cutting completely through the frame/frame-rails on each side of the vehicle/equipment at a point located between the front and rear axles. If other, pre-approved scrappage methods were used, details and documentation are attached. Photos of the disabled engine/chassis that are required pursuant to the Terms and Conditions of the EPA award agreement are attached to this Certificate of Vehicle/Engine Destruction.

Authorized Name: _____
Print Name

Authorized Signature: _____ Date: _____

Note: Documentation must include JPEG images of the following, with corresponding file names:

- | | | | |
|----------------------------|-----------------------------|--------------------------------|----------------------|
| 1) Side profile of vehicle | 3) Engine label | 5) Engine block, prior to hole | 7) Others, as needed |
| 2) VIN | 4) Chassis rail cut in half | 6) Engine block, after hole | |

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

- A. Section 00 70 00 - General Conditions: Record Documents.
- B. Section 01 11 13 – Summary of Work.
- C. Section 01 29 76 – Application for Payment.
- D. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
- E. Section 01 77 00 – Contract Closeout Procedures.
- F. Technical Specifications: Manufacturer's certificates and certificates of inspection.

1.3 MAINTENANCE OF DOCUMENTS AND SAMPLES

- 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, product data, and samples.
 - 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 in other Sections, as listed by spec section in Paragraph 1.2.B, C, and D above.
- 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. Keep record documents and samples available for inspection by the Authority.
- K. 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.
- L. The Authority's approval of the current status of Record Documents will be prerequisite to the Authority's approval of requests for progress payments and request for final payment.
 - 1. Prior to submitting each request for progress payment, secure the Authority's approval of Record Documents as currently maintained.
 - 2. Prior to submitting request for Final Payment, obtain the Authority's approval of final Record Documents.
- M. Do not use job set for any purpose except entry of new data and for review and copying by the Authority.

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 SUBMITTALS

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

1.2 RELATED SECTIONS

- A. Division 1
- B. All other Division 23 Specifications
- C. Division 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. Provide submittals for all materials in each of the Division 23 specification sections which follow and submit under that specification section.
- C. 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.

1.5 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. Contact the Authority prior to completion of all work to schedule substantial completion inspection in accordance with Division 1. 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 the 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.

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 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.
- C. Seal all exterior ceiling and wall penetrations as indicated. Where exterior wall penetrations are accessible from the inside seal both interior and exterior surfaces as indicated.

3.3 EXAMINATION

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

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 SECTIONS

- A. Section 23 05 00 – Common Work Requirements for Mechanical
- B. Section 23 07 19 - Piping Insulation
- C. Section 23 11 13 - Fuel Oil Piping and Equipment
- D. Section 23 21 13 - Hydronic Piping and Equipment
- E. Section 23 35 16 - Engine Exhaust and Crank Vent Piping
- F. Division 26

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 described herein. Provide in accordance with the requirements of Section 23 05 00 - Common Work Results for Mechanical and Division 1.

- B. Product Data: Hangers and Supports: Submit manufacturers catalog data including load capacity.

1.5 QUALITY ASSURANCE

- A. Division 1 – Quality Control
- B. Conform to applicable code for support of coolant and hydronic piping.
- C. Perform Work in accordance with State of Alaska Standards.

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.

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.
- B. Pipe Clamps: Two piece pipe clamp designed to support pipe tight to strut, B-line B20##, or approved equal. Zinc plated carbon steel.
- C. Pipe Straps: Two-hole steel pipe strap. Zinc plated carbon steel.

2.5 FASTENERS

- A. All bolts, nuts, and washers to be zinc plated carbon steel except as specifically noted otherwise.
- B. 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.
- C. Hanger Rods: Continuous threaded rod. Zinc plated carbon steel.

2.6 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.

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 - PIPE HANGERS AND SUPPORTS

- A. Support piping and equipment 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. Independently support pumps and equipment. Supporting piping from connections to equipment shall not be permitted.
- C. Support horizontal piping as scheduled.
- D. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- E. Place hangers within 12 inches of each horizontal elbow or as indicated.
- F. Use hangers with 1-1/2 inch minimum vertical adjustment.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 19.
- K. For specific piping and equipment support details reference Drawings.

3.4 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 SECTIONS

- 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 35 16.10 - Engine Exhaust and Crank Vent Piping.

1.3 SUBMITTALS

- A. Provide submittals for all products and systems described herein. Provide in accordance with the requirements of 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.

1.4 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.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Applicator: Company specializing in performing work specified in this section.

1.6 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.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 EXHAUST PIPE INSULATION

- A. Pipe and Flex Connector: 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.

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.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Insulate engine exhaust piping from turbo outlet up to point indicated on drawings including exhaust flex connectors and flanges.
- B. Install insulation in accordance with manufacturer's installation instructions.

END OF SECTION

SECTION 23 11 13
FUEL OIL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope: This section applies to all diesel fuel and lube oil (oil) piping systems.
- B. Section includes:
 - 1. Fuel oil piping.
 - 2. Fittings and Valves.
 - 3. Hoses.
 - 4. Fuel System Equipment.
 - 5. Day Tank

1.2 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 26 32 13 – Engine Generators.

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
- C. Underwriters Laboratories Inc.: UL 142 – Steel Aboveground Tanks for Flammable and Combustible Liquids.

1.5 SYSTEM DESCRIPTION

- A. Provide equipment as indicated in the Fuel System Equipment Schedules on the Drawings.
- B. Provide piping system components as specified in PART 2.
- C. Provide flanges, unions, or hose couplings at locations requiring servicing. Use unions, flanges, or hose couplings downstream of valves and at equipment connections. Do not use direct welded connections to valves, equipment.

1.6 SUBMITTALS

- A. Provide submittals for all products and systems described herein. Provide in accordance with the requirements of Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
 - 1. Equipment: Submit manufacturers catalog literature for each item indicated in the Fuel System Equipment Schedules on the Drawings.
 - 2. Piping: Submit manufacturers catalog information for pipe materials, fittings, and accessories.
 - 3. Stainless Steel Tubing: Submit manufacturers catalog information for tubing, fittings, and accessories.
 - 4. Valves: Submit manufacturer's catalog information with data and ratings for each service.
 - 5. Hoses: Submit manufacturer's catalog information for hoses, fittings, and accessories.
- C. Shop Drawings:
 - 1. Day Tank: Submit shop drawings for fabrication of day tank. Note that if the tank 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.
- E. Testing: 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 equipment and 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. Stainless steel tubing joints shall use stainless steel swage type fittings with a two-ferrule, mechanical grip design. All stainless steel fitting bodies shall be re-useable when installed with new ferrules.

2.2 EQUIPEMNT

- 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. Provide filters, pumps, gauges, specialty valves, and appurtenances as indicated in the Fuel System Equipment Schedules on the Drawings.

2.3 PIPE AND FITTINGS

- A. Pipe: ASTM A106B seamless black steel pipe, Schedule 80.
- B. 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.
- C. Flanges: ASTM A105 forged steel, ANSI 150# raised face unless indicated otherwise. Butt or socket weld as indicated.

- D. Flange Gaskets: Spiral wound metallic gaskets, Flexitallic or approved equal. Coat with anti-seize prior to assembly.
- E. Flange Bolts: On all exterior piping provide stainless steel bolts, nuts, and washers. Coat with anti-seize prior to assembly.

2.4 TUBE AND FITTINGS

- A. Tube: High-quality, fully annealed Type 316 seamless stainless steel hydraulic tubing, ASTM A269 or equivalent. Tube pressure ratings to be in accordance with ASME B31.1. Hardness not to exceed 90 HRB or 200 HV. Tubing to be free of scratches, suitable for bending and flaring.
- B. Tube Fittings: Straight fittings & tube adapters shall be formed from ASTM A276 Type 316 stainless steel bar stock. Elbows, crosses and tees shall be ASTM A182 Type 316 forged stainless steel. All stainless steel tube fittings to meet or exceed the pressure rating of connected stainless steel tube. Swagelok or approved equal.

2.5 BALL VALVES

- A. 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.

2.6 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.

2.7 FUSIBLE VALVES

- A. Fusible Link Valves: Brass body, FPT ends, 165°F fusible head. Firematic or approved equal. 1/2" Valve Model #12130.

2.8 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.

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.
- D. Prepare tubing and install fittings in strict accordance with manufacturer's instructions.

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. Install fusible valves with stems upright only. 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.

3.5 FUEL AND LUBE OIL PIPING AND EQUIPMENT TESTING AND REPORTING

- A. Perform and document testing in accordance Division 1 – Quality Control. Submit certified test results to the Authority for approval.
- B. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification. Test reports shall be signed and dated and shall include adequate photographs to document test procedure and conditions.
- C. 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.
- D. 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.
- 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.

3.6 SYSTEM STARTUP

- A. Prime equipment and piping prior to running electric pumps and engines.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

- A. Scope: This section applies to all hydronic (glycol) piping systems.
- B. All hydronic piping systems are existing. The work under this contract is limited to minor modification and connection as indicated on the Drawings.
- C. Refilling and/or charging engine systems with glycol solution is included in work under this contract.
- D. Section includes:
 - 1. Heating Recovery and Plant Heating Equipment.
 - 2. Coolant (engine cooling) piping.
 - 3. Heat recovery piping.
 - 4. Hoses and accessories.
 - 5. Engine coolant (ethylene glycol).

1.2 RELATED SECTIONS

- A. Section 23 05 00 – Common Work Requirements for Mechanical.
- B. Section 23 05 29 - Hangers and Supports for Piping and Equipment.
- C. Section 26 32 13 – Engine Generators

1.3 SUBMITTALS

- A. Provide submittals for all products and systems described herein. Provide in accordance with the requirements of Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Submit manufacturers catalog literature for each item indicated on the Hydronic Equipment Schedule on the Drawings.
- C. Submit manufacturers catalog information for pipe materials, fittings, and accessories.
- D. Submit manufacturer's catalog information for hoses and hose clamps.
- E. Submit manufacturer's catalog information for engine coolant ethylene glycol.
- F. 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.

1.5 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.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements before cutting hoses.

PART 2 - PRODUCTS

2.1 PIPING

- A. Provide copper tube mains and branch piping as indicated on Drawings.
 - 1. Copper Tubing: ASTM B88, Type L drawn.
 - 2. Fittings: ASME B16.22 solder wrought copper.
 - 3. Joints: soldered with 95-5 tin-antimony solder or silver solder except on tee drill connections use copper brazing rod.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 AUTOMATIC AIR VENT

- A. Brass body, self-closing float operated valve, screw on cap, 1/4" NPT connection. Maid-O-Mist Auto Air Vent No. 71 or approved equal.

2.7 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.

2.8 ENGINE COOLANT (ETHYLENE GLYCOL)

- A. The glycol shall be extended life (heavy duty) ethylene glycol, Shell Rotella ELC, Chevron Delo XLC, 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**, no exceptions.
- C. The solution shall be packaged in sealed 55 gallon drums and/or 5 gallon pails and labeled "Ethylene Glycol" with pink lettering.

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 - PIPE HANGERS AND SUPPORTS

- A. Install pipe hangers and supports in accordance with Section 23 05 29.

3.4 INSTALLATION - PIPING SYSTEMS

- A. Route piping in orderly manner and slope to drain at low points and vent at high points.
- 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.

3.5 HYDRONIC PIPING SYSTEM AND EQUIPMENT TESTING AND REPORTING

- A. Perform and document testing in accordance Division 1 – Quality Control. Submit certified test results to the Authority for approval.

- B. Test certification shall include gauge pressure, air temperature, time, date, witness, and item or system identification. Test reports shall be signed and dated and shall include adequate photographs to document test procedure and conditions.
- C. Hydrostatically test all new or modified cooling and heat recovery piping at 100 psig minimum for one hour with no noticeable water leaks or pressure drops except as caused by temperature change.
- 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.

3.6 INSTALL HOSES

- A. Cut hoses to length and install in barbed nipples with clamps as indicated.

3.7 FURNISH GLYCOL

- A. Furnish sealed containers of glycol solution as indicated on the drawings.

3.8 CHARGING EXISTING COOLING SYSTEMS (Arctic Village Base Bid and Chenega Bay)

- A. Upon completion of engine installation, piping modifications, and hose connections, add ethylene glycol solution to the cooling system as required to fill engines and piping. Utilize salvaged glycol from demolition work plus new glycol as required.
- B. Operate all engines long enough with adequate load to get thermostats fully open and to circulate glycol through all piping and accessories. Add ethylene glycol solution as required to top off and bring the level in the expansion tank to approximately 50% with the system purged of air and up to normal operating temperature.
- C. Seal drum or pails and turn over remaining glycol to the utility.

3.9 FLUSHING AND CHARGING COOLING SYSTEM (Arctic Village Additive Alternate)

- A. Drain, clean, flush, and fill system as indicated on the drawings.
- B. Upon completion of final filling, operate all engines long enough with adequate load to get thermostats fully open and to circulate glycol through all piping and accessories. Add ethylene glycol solution as required to top off and bring the level in the expansion tank to approximately 50% with the system purged of air and up to normal operating temperature.
- C. Seal drum or pails and turn over remaining glycol to the utility.

3.10 CHARGING NEW PLANT HEATING COOLING SYSTEM (Chenega Bay)

- A. Upon completion of piping modifications and unit heater installation, add propylene glycol solution to the system as required to fill new piping. Utilize existing glycol from drum in the adjacent heat recovery module.
- B. Purge air prior to starting pump. Cycle pump on and off multiple times and purge remaining air then close valve on air vent.

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. Dampers.
 - 3. Actuators.

1.2 RELATED SECTIONS

- 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 SUBMITTALS

- A. Provide submittals for all products and systems described herein. Provide in accordance with the requirements of Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data: Submit manufacturers catalog literature for each item indicated on the Ventilation Equipment Schedule on the Drawings.
- 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.

1.5 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.

1.6 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.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section.
- B. Installer: Company specializing in performing work of this section.

1.8 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.

1.9 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 or 6061 alloy.
- 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. 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. Provide stainless steel mesh and frames where indicated on the Drawings.

2.3 CONTROL DAMPER

- A. Provide damper in accordance with the Ventilation Equipment Schedule on the Drawings.

2.4 ACTUATORS

- A. Provide actuator in accordance with the Ventilation Equipment Schedule on the Drawings.

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 operation of dampers.

END OF SECTION

SECTION 23 35 16
ENGINE EXHAUST AND CRANK VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Engine Exhaust piping
 - 2. Crank Vent piping
 - 3. Mufflers
 - 4. Thimbles
 - 5. Flanges and Gaskets
 - 6. Crank Vent Hose

1.2 RELATED SECTIONS

- 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 - 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. 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 and specified elsewhere.

1.5 SUBMITTALS

- A. Provide submittals for all products and systems described herein. Provide in accordance with the requirements of Section 23 05 00 - Common Work Results for Mechanical and Division 1.
- B. Product Data:
 - 1. Piping: Submit manufacturers catalog information for pipe and fittings, both carbon steel pipe and copper tubing as indicated.
 - 2. Flanges and Gaskets: Submit manufacturer's catalog information.
 - 3. Mufflers: Submit manufacturer's catalog information.
 - 4. Rain Caps: Submit manufacturer's catalog information.
 - 5. Crank Vent Hose: Submit manufacturer's catalog information for hose and clamps.
- C. Shop Drawings:
 - 1. Thimbles: Submit manufacturer's shop drawings.
 - 2. Crank Vent Condensate Trap: Submit shop drawings for fabrication of trap. Note that if the trap will be fabricated exactly as indicated on the Drawings, the design Drawings can be submitted in lieu of shop drawings.

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 Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- D. 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. 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 piping may be ASTM A106B seamless black pipe.
- B. Flanges: ANSI 150#, configuration as indicated on Drawings.
- C. Flange Gaskets: Full face, rated for minimum 1000F continuous. Garlock 4122-FC, Metal Tech HT-195, or approved equal.
- D. Flange Bolts: Plain carbon steel (black) or stainless steel bolts, nuts, and washers. Coat with high temperature anti-seize prior to assembly.
- E. Perform pipe welding with experienced welder with current API or equivalent certification for pipe welding in all positions.

2.2 FLEXIBLE CONNECTORS

- A. Exhaust Pipe Flexible Connectors: Specified with Engine Generator, see Section 26 32 13 – Engine Generators.

2.3 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, Miratech E.M. Series, Harco, or approved equal. See Drawings for size.

2.4 THIMBLES

- A. Thimbles to be stainless steel, triple-wall, insulated, ventilated, and listed for zero clearance to combustibles, Harco WT-47 Series, or approved equal

2.5 RAIN CAPS

- A. Exhaust rain caps, hinged type, all stainless steel construction, G.T. Exhaust Systems or approved equal. See Drawings for size

2.6 CRANK VENT PIPING

- A. Provide copper crank vent piping as indicated on Drawings.
- B. Copper Tubing: ASTM B88, Type L drawn.
- C. Fittings: ASME B16.22 solder wrought copper.
- D. Joints: Soldered with 95-5 tin-antimony solder or silver solder. Note that at Contractors option joints may be brazed with copper brazing rod.

2.7 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.

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.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- D. Piping Insulation: Insulate interior exhaust piping as indicated on the Drawings.

3.5 INSTALLATION – MUFFLER

- A. Install muffler in accordance with manufacturer's installation instructions and support as indicated on the Drawings.

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 which contains 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.

1.2 RELATED REQUIREMENTS

- A. This section applies to all Division 26 work.
- B. See Divisions 1 and 23 which contain information and requirements that apply to work specified herein.

1.3 TELEPHONE SERVICE

- A. Telephone service is not a part of this project.

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. When the nature of the work requires only an Electrical Contractor to perform the work, then the word General Contractor shall mean Electrical Contractor.
- 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 Schedules on the Drawings.
 - 2. All materials in the Electrical Conductor Schedules 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 each of 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 electrical systems and equipment shown on the drawings.
- 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 direct supervision of a licensed Electrical Administrator.
- D. Submit written proof of all Journeyman and Apprentice Electricians' current licenses.
- E. Submit certification for tests and inspections required by the electrical inspector having jurisdiction. Certificates of approval that are issued shall be transmitted to the Authority.
- 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 the Substantial Completion, all costs of any subsequent inspections shall be borne by the Contractor at no additional cost to the Authority.

1.16 WARRANTY

- F. Division 1 - Closeout Requirements: Warranties.
- G. 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.

1.17 CERTIFICATE OF COMPLETION

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

I, _____(Name), of _____(Firm), certify that the Electrical Work is complete in accordance with Contract Drawings and Specifications, and authorized change orders (copies of which are attached hereto), and will be ready for Final Inspection as of _____(Date). I further certify that the following Specification requirements have been fulfilled:

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

SIGNED: _____ DATE: _____

TITLE: _____

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. Division 1
- B. Division 23
- C. Section 26 05 00 Common Work Results for Electrical
- D. All other Division 26 Specifications

1.3 COORDINATION

- A. Layout all the work in advance and avoid conflict with other Work in progress. 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 clearance 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 Labels and Nameplates:
 - 1. Provide rigid engraved labels and nameplates of laminated plastic 1/16-inch thick with white letters on a black or gray background. Label for emergency equipment shall be red with white letters.
 - a. Securely attach labels with two screws, minimum, per label, unless rating of panel is affected, use epoxy.

- 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. Label and Nameplate Locations:
 - a. Provide 1/2-inch minimum height letters on following equipment:
 - 1) Service disconnects (red background).
 - 2) Secondary feeder breakers in distribution equipment. Designation as required by load served.
 - 3) Special equipment housed in cabinets, as designated on 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. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits provided for future equipment.
 - D. Conduits: Mark all conduits entering or leaving panels with indelible black marker with the circuit numbers of the circuits contained inside.
 - E. Junction Boxes: Mark the circuit numbers of wiring on all junction boxes with steel covers. Mark with indelible black marker.
 - F. 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. Support all electrical systems in accordance with the Specifications and as indicated on the Drawings.

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 ceiling and 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 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 structures grounded as shown on the Drawings.
 2. The neutral conductors grounded only where specifically indicated on the Drawings.
 3. Other items or equipment as indicated on the Drawings.
 4. Current carrying capacity of the grounding and bonding conductors shall be in conformity with Tables 250.66 and 250.122 of the NEC.
- B. All structure bonding shall be in accordance with manufacturer's recommended practice.

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. 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.

2.3 FITTINGS AND ACCESSORIES

- A. Hanger Rods: Continuous threaded rod. Zinc plated carbon steel.
- B. Provide fittings, brackets, channel nuts, and accessories designed specifically for use with specified channel strut. Zinc plated carbon steel.
- C. Pipe Clamps: Two piece pipe clamp designed to support pipe tight to strut, B-line B20##, or approved equal.

- D. Fasteners: All bolts, nuts, and washers to be zinc plated carbon steel except in exterior locations provide galvanized fasteners.

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. Support from structure only.
- 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 wood or concrete 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 26 05 00 Common Work Results for Electrical
- B. Section 26 05 02 Basic Materials and Methods
- C. Section 26 05 26 Grounding and Bonding for Electrical Systems
- D. Section 26 05 29 - Hangers and Supports 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 WIREWAY

- A. UL listed; NEMA 12, enamel finished; gasketed hinged covers with screw clamps. Furnish complete with all fittings, couplings, and accessories; Hoffman, B-Line or equivalent.

2.5 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.

2.6 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.
- C. EXTERIOR - All exterior above grade locations shall be galvanized rigid conduit (GRC).
- D. 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.

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. 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.
- G. 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.
- H. 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.

- I. 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.
- J. 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

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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 01

NEW 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, Device Net, 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 switchboards 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.
 - 3. Metering Equipment: Shark 200.
 - 4. Feeder Protection Relay (FPR): Schweitzer Engineering Laboratories, Inc.
- C. Acceptable manufacturers of all components not otherwise indicated shall be: Allen-Bradley, Eaton, General Electric, 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 1 or NEMA 12 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. 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 two individual hinged doors 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. Provide one power section to contain 480V power equipment and ancillary devices. Provide one control section to contain the low voltage (120V max) controls as indicated on the project design drawings.
- H. Power and control cables shall enter from the top, side, and back as indicated on the project design drawings.
- I. Where the main bus is not isolated by barrier plates, provide a glastic cover for isolation over the entire length of the bus.
- J. 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 power 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. 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.
- F. 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.
- G. 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 T-Max, Eaton, General Electric, Square D, 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 25,000 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 5600639, 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 and feeder meters - 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 CONTROLLER

- A. Genset Controller (GC). Door mounted style with display face, Woodward easYgen Model 3200XT-P1, Part Number 8440-2082, no substitutes.
- B. Signal Converter. Multi-input, 4-20mA Output, 2 programmable relay outputs. Provide for isolation protection of easYgen analog inputs. Automation Direct, 884116, or approved equal.
- C. EasYgen digital I/O expansion module, 8 inputs, 8 outputs. DIN rail mounting, 24V DC. Woodward 8440-2028, no substitutes.
- 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. Device Net Scanner. Allen-Bradley 1769-SDN.
 4. ModBus TCP/IP Communications Module. Pro-Soft MVI69E-MBTCP.
 5. Right End Cap/Terminator. 1769-ECR.
 6. Compact Blocks, 24VDC, as required which may include the following:

- a. LDX I/O input base module 16 point, universal. Allen-Bradley 1790D-T16BVO.
 - b. LDX I/O input expansion module 16 point, universal. Allen-Bradley 1790-T16BVOX.
 - c. LDX I/O output base module 16 point, sourcing. Allen-Bradley 1790D-T0B16.
 - d. LDX I/O output expansion module 16 point, sourcing. Allen-Bradley 1790-T0B16X.
 - e. LDX I/O input/output base module 8 point in, 8 point out sourcing. Allen-Bradley 1790D-T8BV8B.
 - f. LDX I/O input/output expansion module 8 point in, 8 point out sourcing. Allen-Bradley 1790-T8BV8BX.
 - g. LDX I/O analog input module, 4 channel, 4-20 mA DC. Allen-Bradley 1790D-TN4C0.
 - h. LDX I/O analog output module, 2 channel. Allen-Bradley 1790D-TNOC2.
 - i. LDX I/O RTD input module, 4 channel. Allen-Bradley 1790D-T4R0
7. 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.

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 control 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, and optional 4-20mA I/O card. SHARK 200-60-10-V2-D-INP100S-20mAOS, no substitutes.

- B. Station Service Meter. The station service meter shall be identical to the bus meter except without the optional 4-20mA I/O card. SHARK 200-60-10-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 control section.
- B. 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.
- C. 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 high speed internet. See Summary of Work, Section 01 11 13, 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 either from 24VDC engine batteries, or from 12VDC-24VDC converters powered from 12VDC 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 control 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 control section.
 - 3. 12VDC-24VDC Converter. 12VDC input, minimum 4 amp, 24VDC output at 45°C. PULS CD5.243, or approved equal. Install converter in the control section for each 12V generator.
- C. The DC power from the engine batteries shall enter in the control 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 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 system (master, generator, feeder, VFD) shall be isolated through individual 15A circuit breakers.
- 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 one set of terminals for connection of incoming 120V AC power, 20A, single phase. The 120V AC system shall include:
 - 1. Control and Utility Power – One circuit shall provide power to the UPS, the 120V AC to 24V DC power supply, lights, ventilation fans, and convenience receptacle as indicated and required for each section.
 - 2. 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.
 - 3. The UPS shall be installed on the rack in the control 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 CONTROL SECTION ASSEMBLY

- A. Provide the following components for each engine generator.
 1. Genset Controller (GC). The GC shall communicate to the PLC via DeviceNet I/O blocks through the DeviceNet scanner. 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 adjacent to the GC. All switches for the entire project shall utilize a common key. Provide two keys for each switch.
 3. Provide engine generator annunciation LED's, mounted immediately above the GC, left to right:
 1. Engine Running (green).
 2. Alarm/Lockout (red).
 3. Normal Stop (amber).

4. Lead Engine (green).
5. Engine Alarm (red) – See Note A.
6. Generator Alarm (red) – See Note B.
7. Breaker Closed (red).
8. Breaker Open (green).

Note A The engine alarm light shall turn on for the following engine (mechanical) alarm conditions: Low Oil Pressure, Oil Level, High Coolant Temperature, Over Speed, Over Crank, Running Timeout, Air Filter Plugged, High Exhaust Temperature.

Note B The generator alarm light shall turn on for the following generator (electrical) alarm conditions: Generator Breaker Trip, Fail to Synchronize, Over Current, Under Voltage, Over Voltage, Under Frequency, Over Frequency, Reverse Power.

Configure the system so that pressing the ALARM RESET on the GC clears all alarms.

- B. Provide the following control components:
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. 12VDC-24VDC Converter. For Gen #2 only.
 9. UPS/Server Rack – One standard 4-post rack, 19” wide for installation of the UPS and the data storage server.
 10. Uninterruptable Power System (UPS)
 11. Secure Serial to Ethernet Server.
 12. Dead bus relay.
 13. Industrial Ethernet Switch, minimum quantity two.
 14. 24VDC 15A circuit breaker for control power.
 15. 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.
 16. Convenience receptacle, 120 volt duplex GFI receptacle, din rail mount, 15 ampere rating.

17. LED panel illumination kit, complete with door switch
18. System Mode Switch, AUTO / MAN ISOCH.
19. Emergency Stop Button.
20. A single RESET push button that manually resets all master alarms.
21. A single LAMP TEST push button that tests all master and engine generator annunciation LEDs simultaneously. Note that this includes all master and engine generator lamps but does not include VFD lamps.
22. Feeder protection relay (FPR).
23. Feeder breaker manual control switch, open/close spring return to center.
24. Feeder breaker Status LED indicating lights (mount immediately above feeder breaker control switch):
 - a. Feeder Breaker Open (green).
 - b. Feeder Breaker Closed (red).
25. Terminal Blocks, Relays, Timers, Bases, as required.
26. Spare Input: Provide a minimum of 2 spare PLC discreet input pairs wired to terminal blocks.
27. Spare Output: Provide a minimum of 2 spare two-pole relays wired to terminal blocks and controlled by PLC.
28. Master annunciation LED's, mount near top of cabinet above power meters, 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).

Second Row

1. Station Service Breaker Open (red).
2. VFD Main Breaker Open (red).
3. Feeder Breaker Trip (red).
4. Feeder Fail To Close (red).
5. Spare (red).
6. Spare (red).

- C. Provide two ambient air temperature sensors, one for outside air temperature and one for inside air temperature. Temporarily secure in the control section for shipping. Final field installation shall be outside the switchgear.

2.19 POWER SECTION ASSEMBLY

- A. Provide the following components for each engine generator.
 - 1. Generator Circuit Breaker.
 - 2. Control power transformer for spring charging motor, size as indicated on the project design drawings.
 - 3. Potential Transformers, quantity and ratio as indicated on the project design drawings.
 - 4. Current Transformers for relaying, quantity and size as indicated on project design drawings. Provide with shorting terminal blocks.
- B. Provide the following feeder components:
 - 1. Feeder Circuit Breaker.
 - 2. Control power transformer for spring charging motor, size as indicated on the project design drawings.
 - 3. Current Transformers, quantity and size as indicated on the project design drawings. Provide with shorting terminal blocks.
 - 4. Potential Transformers, quantity and ratio as indicated on the project design drawings.
- C. Provide the following components:
 - 1. Circuit breakers for station service and VFD branch circuits, manually operated, with auxiliary contact, sized as indicated on the project design drawings.
 - 2. LED panel illumination kit, complete with door switch.
- D. Provide the following VFD components. Locate 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 control section. Provide a single cable connection for VFD power from the bus through the VFD main circuit breaker.
10. Install terminal blocks in a single location near the top of the 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.
11. Provide power for radiator control and temperature sensors from the 24VDC switchgear control power.
12. Provide ambient air temperature sensor permanently installed within the VFD 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 (GC configuration software).
 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, archive on the server copies of all software packages, setup files, final program settings, and Tag List.
- F. 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.

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. Verify that the equipment performs each task as specified.
 - 2. Verify all engine and generator protection functions for each GC.
 - 3. Verify all feeder protection functions for the FPR.
 - 4. Verify that the PLC starts and stops each generator based on the requirements of the demand table specified herein.
 - 5. Verify that each annunciation point operates correctly. For external alarms, simulate the alarm.
 - 6. Verify that all screens on the SCADA display correct data. Use an external computer to verify remote access for SCADA.
 - 7. 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.
 - 8. Disconnect 120-volt AC control power in the control 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 engine and generator protection functions for each GC.
 - 3. Verify all feeder protection functions for the FPR.
 - 4. Verify that the PLC starts and stops each generator based on the demand table requirements specified under Part 4.
 - 5. Verify that each VFD operates properly.
 - 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. Verify that all trending functions are operational and are being archived on the data storage server.
 - 9. Disconnect 120-volt AC control power in the control 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 and minutes.
 - 3. Generator Lockout Switch. Connect key switch to GC Discrete Input 5.
 - 4. 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.

5. 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.
6. Air Filter Vacuum. Monitor air filter vacuum through GC Analog Input 2 via a 4-20mA signal converter. The air filter vacuum transmitter is 4-20mA, -408" H₂O to 0" H₂O range. Power supply for the signal converter shall be provided from the GC power supply.

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 SYSTEM MONITORING

- A. The PLC shall monitor and provide the following:
 1. Plant Total Fuel Consumption. The PLC shall calculate the total plant fuel consumption from the day tank supply meter. The day tank meter pulser provides one pulse per each gallon of fuel (*not used at this time, provide function for future use*).
 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. (*not used at this time, provide function for future use*).
 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.

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. (*not used at this time, provide function for future use*).

4.5 HEAT RECOVERY SYSTEM MONITORING (NOT USED THIS SECTION)

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. Engine Water Jacket Temperature (°F)
 - 8. Engine Exhaust Temperature (°F)
 - 9. Engine Oil Pressure (PSI)
 - 10. Engine Air Cleaner Vacuum (in-H₂O)
 - 11. Engine Fuel Flow Rate (GPH)
 - 12. Engine Total Fuel Use (Gal)
 - 13. Engine Oil Level Switch
 - 14. Engine ECU – All available data from Engine Control Unit (ECU)
 - 15. Lead Engine - where two engines are the same capacity
- 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.
 3. Feeder Metering. For systems with feeder power meters provide equivalent data to the station service metering.
- F. DeviceNet Status
- G. Fuel System Data
 1. Plant total fuel use
 2. Plant fuel efficiency
 3. Plant low fuel alarm
- 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. VFD breaker open
 3. VFD frequency
 4. VFD status (On, Off, Bypass, Running, Fault)

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 DeviceNet 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 control the engine speed using 0.25-4.75VDC signal to the engine ECU.
 - 5. The GC shall control the voltage regulator through the voltage regulator auxiliary voltage bias input.
 - 6. 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 generating units shall start and come up to rated speed. 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. After a time delay of 15 seconds, 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. The entire startup and synchronization sequence shall not exceed 10 seconds. 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.

Demand Control

Demand Control	Number of Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	1	100	90	---
Level 2	2	200	180	80
Level 3	All	300	---	160

Note: All three generators 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 – Indicate alarm on the SCADA. 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” H2O, 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” H2O.
 - i. High Exhaust Temperature – Illuminate the appropriate alarm light when the exhaust temperature exceeds the alarm level of 1000°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.
 - j. Fail to Synchronize - Provide a Type 3 shutdown if a unit fails to synchronize after the preset time delay.
 - k. Over Current - Provide a Type 3 shutdown on operation of an overcurrent element.
 - l. Under Voltage - Provide a Type 3 shutdown on operation of an under voltage element, 90% of nominal voltage.

- m. Over Voltage - Provide a Type 3 shutdown on operation of an over voltage element, 110% of nominal voltage.
 - n. Under Frequency - Provide a Type 3 shutdown on operation of an under frequency element, 58.2 Hz.
 - o. Over Frequency - Provide a Type 3 shutdown on operation of an over frequency element, 61.8 Hz.
 - p. Reverse Power - Provide a Type 3 shutdown on operation of a reverse power element, 10%.
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. *Note that the fire alarm panel is existing and must be reconnected to the new switchgear.*
 - 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. *Note that the low coolant switch is existing and must be reconnected to the new switchgear.*
 - 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 control 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 System 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.

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 PID Reference Temperature.
 5. Configure the OIU shall 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. 9% = rSL
 - d. 170°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

4.11 HEAT RECOVERY SEQUENCE OF OPERATION (NOT USED THIS SECTION)

END OF SECTION

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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 02

UPGRADE EXISTING PRIME POWER SWITCHGEAR

PART 1 - GENERAL

1.1 SCOPE

- A. The Work shall consist of, but not be limited to, designing, fabricating, testing and providing complete control system upgrades to existing prime power parallel diesel generation switchgear as indicated 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. The project design drawings consist of DERA project design drawings, manufacturer's original switchgear shop drawings, plus example drawings of prior completed upgrade projects similar to this work.
- D. 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, nor are all components identified required on all systems. 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
- E. 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.
- F. The upgraded paralleling switchgear shall be capable of unattended automatic and manual operation. The switchgear controls shall be a fully coordinated system that provides the functions and features as specified herein.
- G. 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.
- H. Automatic start/stop and demand control shall be accomplished through the Genset Controllers (GC). Each generator has an existing electrically operated contactor to perform the normal online/offline paralleling functions of the generator which will be controlled by the GC, and a molded case circuit breaker for equipment and conductor protection.
- I. The distribution feeder has an existing electrically operated contactor to perform the normal online/offline functions and a molded case circuit breaker for equipment and conductor protection.
- J. The Contractor shall fully test the upgraded switchgear 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

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 the locations of all major face mounted devices such as meters, GC, OIU, and FPR, etc.
 - 4. Provide internal wiring and connection diagrams for each section of the switchgear, a one-line diagram, and three-line diagrams based on the existing switchgear drawings. 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, master, feeder, and VFD. 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, FPR's, GC's, OIU, PLC, VFD's, Compact I/O blocks, Serial to Ethernet servers and Data Storage Server.
 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.
- E. Provide proposed settings for review for each GC as specified in the sections that follow.

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 existing switchgear is listed and labeled as an assembly under UL 891 or equivalent independent testing laboratory standard recognized by the State of Alaska. All work 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 upgraded 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.

1.5 FABRICATOR QUALIFICATIONS

- A. The switchgear upgrades 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 control panels and/or switchboards. 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 new 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.

- 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.
 3. Metering Equipment: Shark 200.

- C. Acceptable manufacturers of all components not otherwise indicated shall be: Allen-Bradley, Eaton, General Electric, IDEC, or Square D.

2.3 SWITCHGEAR ENCLOSURE

- A. Where new panel faces are required for installation of new face mounted equipment, the panels shall be minimum 14 gauge steel, painted as indicated below.
- B. Where back or side pans are required for installation of new equipment and wiring, the panels shall be minimum 16 gauge steel, painted as indicated below.
- C. Panel faces and back/side pans shall be coordinated for proper fit and function within the existing switchgear cabinets.

2.4 PAINTING

- A. Steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. 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.
- B. 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. Each generator has a terminal strip for interconnection to its switchgear generator section. The switchgear terminal strip shall be arranged and numbered as shown by the terminal strip detail on the original shop drawings. Terminal blocks shall

be clearly labeled and shall match the designation shown on the Fabricator's 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 (NOT USED THIS SECTION)

2.7 GENERATOR AND DISTRIBUTION CIRCUIT BREAKER

- A. All generator, feeder, and station service circuit breakers are existing and shall remain in service. Provide revised trip plugs where indicated.

2.8 SWITCHGEAR DEVICES

Note that some of the devices listed below may not be required for this system. Check the manufacturer's original switchgear shop drawings for specific requirements. Where required, furnish as specified.

- 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 Electroschwitch Series 24 or approved equal.
 - 1. System Mode Switch. AUTO/MAN, Two-position lever operated maintained contact. Electroschwitch 24201C or approved equal.
 - 2. Feeder Breaker Control Switch. TRIP/ - /CLOSE Three-position lever operated momentary contact spring return to center, Electroschwitch 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. All

switches for the entire project shall utilize a common key. Provide two keys for each generator section.

- 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 5600639, 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. Manually operated molded case circuit breakers protect the station service transformer and other branch circuits as indicated on the one-line diagram on the project design drawings. The breakers are provided with auxiliary contacts to indicate position.
- 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 and feeder meters - 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.

2.9 GENSET CONTROLLER

- A. Genset Controller (GC). Door mounted style with display face, Woodward easYgen Model 3200XT-P1, Part Number 8440-2082, no substitutes.
- B. Signal Converter. Multi-input, 4-20mA Output, 2 programmable relay outputs. Provide for isolation protection of easYgen analog inputs. Automation Direct, 884116, or approved equal.
- C. EasYgen digital I/O expansion module, 8 inputs, 8 outputs. DIN rail mounting, 24VDC. Woodward 8440-2028, no substitutes.
- 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. Device Net Scanner. Allen-Bradley 1769-SDN.
 4. ModBus TCP/IP Communications Module. Pro-Soft MVI69E-MBTCP.
 5. Right End Cap/Terminator. 1769-ECR.
 6. Compact Blocks, 24VDC, as required which may include the following:
 - a. LDX I/O input base module 16 point, universal. Allen-Bradley 1790D-T16BVO.
 - b. LDX I/O input expansion module 16 point, universal. Allen-Bradley 1790-T16BVOX.

- c. LDX I/O output base module 16 point, sourcing. Allen-Bradley 1790D-T0B16.
 - d. LDX I/O output expansion module 16 point, sourcing. Allen-Bradley 1790-T0B16X.
 - e. LDX I/O input/output base module 8 point in, 8 point out sourcing. Allen-Bradley 1790D-T8BV8B.
 - f. LDX I/O input/output expansion module 8 point in, 8 point out sourcing. Allen-Bradley 1790-T8BV8BX.
 - g. LDX I/O analog input module, 4 channel, 4-20 mA DC. Allen-Bradley 1790D-TN4C0.
 - h. LDX I/O analog output module, 2 channel. Allen-Bradley 1790D-TNOC2.
 - i. LDX I/O RTD input module, 4 channel. Allen-Bradley 1790D-T4R0
7. 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.

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 (NOT USED THIS SECTION)

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, and optional 4-20mA I/O card. SHARK 200-60-10-V2-D-INP100S-20mAOS, no substitutes.
- B. Station Service Meter. The station service meter shall be identical to the bus meter except without the optional 4-20mA I/O card. SHARK 200-60-10-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.
- B. 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.
- C. 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 high speed internet. See Summary of Work, Section 01 11 13, 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 either from 24VDC engine batteries, or from 12VDC-24VDC converters powered from 12VDC 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.
 - 3. 12VDC-24VDC Converter. 12VDC input, minimum 4 amp, 24VDC output at 45°C. PULS CD5.243, or approved equal. Install converter in the generator section of each 12V generator as indicated.
- 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 Control and Utility Power – Provide one set of terminals for connection of incoming 120V AC power, 20A, single phase. The 120V AC system shall include:
 - 1. Control and Utility Power – One circuit shall provide power to the UPS, the 120V AC to 24V DC power supply, lights, ventilation fans, and convenience receptacle as indicated and required for each section.
 - 2. 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.
 - 3. The UPS shall be installed on the rack in the control section. It shall be connected to provide 120V AC power to the data storage server.

2.17 VARIABLE FREQUENCY DRIVES (NOT USED THIS SECTION)

2.18 ENGINE/GENERATOR SECTION ASSEMBLY

- A. Each generator has an electrically operated contactor to perform the normal online/offline functions and a molded case circuit breaker for equipment and conductor protection.
- B. 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 Devicenet I/O Blocks through the DeviceNet scanner. 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. Provide Terminal Blocks, Relays, Timers, Bases, as needed.
 - 3. Provide a new LED panel illumination kit complete with door switch.
 - 4. Provide a new 24VDC 15A circuit breaker for control power, as needed.
- C. Connect to existing Generator Lockout Switch or provide new as required.
- D. Connect to existing potential transformers.
- E. Connect to existing current transformers and/or provide new as indicated on project design drawings. Install shorting pins in shorting terminal blocks prior to disconnecting CTs.

- F. Connect to existing generator contactor status annunciation lamps, or provide new as required.
- G. Connect to existing alarm annunciation lamps mounted near top of each switchgear cabinet. See existing switchgear drawings for function.
- H. For generators with mechanical governors, provide the following controls and sensors to interface with the GC:
 - 1. Configurable Input/Output Module. Converts analog and digital I/O's to J1939. 8-24VDC input, CAN J1939 port, 4 digital inputs, 2 digital outputs, Type K and J thermocouple input, 2 analog inputs (battery voltage and configurable 0-5VDC or 4-20mA), and Magnetic Pick-up input for speed sensing. Murphy, XM500 P/N: 78700420 or approved equal.
 - 2. Oil Pressure Sending Unit. 1/8" NPT connection, 0-100 psi, 2-wire ungrounded. Murphy ES2P-100 P/N: 05701858 or approved equal. Connect to XM500 Pin1-Grey.
 - 3. Temperature Sending Unit. 1/2" NPT connection, 2-wire ungrounded. Murphy ES2T-250-1/2 P/N: 10702013 or approved equal. Connect to XM500 Pin4-Grey. Include optional terminal boot.
 - 4. Engine Speed Control. Reuse existing engine mag pickup and speed control governor. Connect mag pickup to XM500 and to GC mag pickup input. Connect existing governor speed bias to GC Analog Output 1, and configure GC output as required for existing governor speed bias.

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. Feeder Meters on systems with separate feeder meters, quantity as required.
 - 6. Data Storage Server.
 - 7. Control Power Supply, 120VAC / 24VDC.
 - 8. Battery Buffer Module.
 - 9. UPS/Server Rack – One standard 4-post rack, 19" wide for installation of the UPS and the data storage server.
 - 10. Uninterruptable Power System (UPS)
 - 11. Secure Serial to Ethernet Server.
 - 12. Dead bus relay.

13. Provide 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.
 14. Industrial Ethernet Switch, minimum quantity two
 15. Terminal Blocks, Relays, Timers, Bases, as required.
 16. Spare Input: Provide a minimum of 2 spare PLC discreet input pairs wired to terminal blocks.
 17. Spare Output: Provide a minimum of 2 spare two-pole relays wired to terminal blocks and controlled by PLC.
 18. Provide a new 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.
 19. Provide a new receptacle, 120 volt duplex GFI receptacle, din rail mount, 15 ampere rating.
 20. Provide a new LED panel illumination kit complete with door switch.
 21. Provide a new 24VDC 15A circuit breaker for control power, as needed.
- B. Connect to existing System Mode Switch or provide new as required.
- C. Connect to existing Emergency Stop Switch or provide new as required.
- D. Connect to existing alarm annunciation lamps mounted near top of each switchgear cabinet. See existing switchgear drawings for function.
- E. Connect to two existing ambient air temperature sensors, one for outside air temperature and one for inside air temperature.

2.20 DISTRIBUTION FEEDER SECTION ASSEMBLY

- A. The distribution feeder has an electrically operated contactor to perform the normal online/offline functions and a molded case circuit breaker for equipment and conductor protection.
- B. Connect to existing circuit breaker shunt trip and alarm indication as required.
- C. Connect to existing potential transformers.
- D. Connect to existing current transformers. Install shorting pins in shorting terminal blocks prior to disconnecting CTs.

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 (GC configuration software).

3. SHARK metering software (latest version).
 4. LogMeIn (AEA will provide installation credentials)
 5. 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, archive on the server copies of all software packages and licenses, setup files, final program settings and Tag List.
- F. 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.

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.

3.3 FACTORY TESTING

- A. Prior to shipping, the Fabricator shall install software, program equipment and devices, and bench test the control systems to the maximum extent practical.
- B. The Fabricator shall calibrate and set all protective devices.
- C. 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.
- D. 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.

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 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 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. Verify that all trending functions are operational and are being archived on the data storage server.
 - 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. Repeat tests during Substantial Completion as required by the Authority to adequately demonstrate satisfactory operation of all functions.

3.5 PACKAGING

- A. All 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.
- B. Exterior of crating shall be clearly marked with the community name and the contents identification (e.g. "Community" Gen #2).

- C. 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. Electronically Governed Engine. Monitor engine speed, jacket water temperature, lubricating oil pressure, and fuel flow rate from the engine ECU via J1939.
 - 2. Mechanically Governed Engine. Monitor engine speed, jacket water temperature, and lubricating oil pressure from the specified Configurable Input/Output Module via J1939.
 - 3. Engine Runtime. Log and maintain engine runtime. Time shall be expressed in hours and minutes.
 - 4. Generator Lockout Switch. Connect key switch to GC Discrete Input 5.
 - 5. Oil Level Switch. Monitor status of existing 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 filter vacuum through GC Analog Input 2 via a new 4-20mA signal converter. The existing intake air filter vacuum transmitter is 4-20mA, -408" H2O to 0" H2O range. Power supply for the signal converter shall be provided from the GC power supply.

4.2 AMBIENT AIR TEMPERATURE MONITORING

- A. The PLC shall monitor the following air temperatures through the RTD Input Module via existing 2-wire, 100 ohm, platinum RTDs.
 - 1. Outside air temperature.
 - 2. Inside air temperature.

4.3 FUEL SYSTEM MONITORING

- A. The PLC shall monitor and provide the following:
 - 1. Plant Total Fuel Consumption. The PLC shall calculate the total plant fuel consumption from the day tank supply meter. The existing 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 existing day tank control panel will open when the fuel level in the day tank drops below a preset level.
4. Generator Fuel Consumption. For electronically governed engines, the PLC shall read the instantaneous fuel flow rate (gallons per hour) and the total fuel consumption (gallons) from the engine ECU via J1939.

4.4 COOLING SYSTEM MONITORING

A. The PLC shall monitor the following:

1. Low Coolant Alarm. Monitor low coolant level switch status. An existing 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 an existing 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. *(not used at this time, provide function for future use).*

4.5 HEAT RECOVERY SYSTEM MONITORING (NOT USED THIS SECTION)

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 where two generators are the same capacity.
- C. Engine/Generator Data:
 1. Alarms – All engine/generator alarm conditions
 2. Status of the contactor (open or closed)
 3. Trip indication of breaker.
 4. Phases A, B, and C voltage, current, and power factor

5. Generator Frequency (Hz)
 6. Engine Speed (RPM)
 7. Engine Run Time (hours)
 8. Engine Water Jacket Temperature (°F)
 9. Engine Exhaust Temperature (°F)
 10. Engine Oil Pressure (PSI)
 11. Engine Air Cleaner Vacuum (in-H₂O)
 12. Engine Fuel Flow Rate (GPH) – engines with an ECU
 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 generators are the same capacity
- 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 contactor
 2. Trip indication for each feeder breaker.
- F. DeviceNet Status
- G. Fuel System Data
1. Plant total fuel use
 2. Plant fuel efficiency
 3. Plant low fuel alarm
- H. Ambient Temperature Data
1. Outside Air Temperature
 2. Inside Air Temperature
- I. Engine Coolant Data
1. Low engine coolant level alarm.
 2. Engine coolant return temperature

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. Each GC shall be fully capable of operating the individual generator with the communications bus disabled and 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 contactor operation.
 - 1. The GC shall perform all engine and generator safety functions. Provide annunciation through the PLC via DeviceNet 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 control the engine speed using 0.25-4.75VDC signal to the engine ECU, or +/- 3VDC signal for a mechanically governed engine.
 - 5. The GC shall control the voltage regulator through the voltage regulator auxiliary voltage bias input.
 - 6. 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 contactor 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 generating units shall start and come up to rated speed. 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. After a time delay of 15 seconds, the PLC shall close the feeder contactor and energize the feeder. 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. The entire startup and synchronization sequence shall not exceed 10 seconds. 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 contactor, and shut off the engine after a cool-down period. If there is no other unit on-line, the generator contactor 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 system 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.

Demand Control

Demand Control	Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	#3 or #4	100	90	---
Level 2	#1 or #2	150	135	80
Level 3	#1 or #2 & #3	250	225	120
Level 4	#1 & #2	300	270	200
Level 5	#1 & #2 & #3	400	---	240

Notes:

- 1) Generator #4 will be installed under Additive Alternate. Provide all programming and function for Generator #4 under Base Bid.
- 2) Generators #1 and #2 are equal capacity and Generators #3 and #4 are equal capacity. 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 contactor, 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 contactor 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 contactor, 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” H2O, 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” H2O.

- i. High Exhaust Temperature – Illuminate the appropriate alarm light when the exhaust temperature exceeds the alarm level of 1000°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.
 - j. Fail to Synchronize - Provide a Type 3 shutdown if a unit fails to synchronize after the preset time delay.
 - k. Over Current - Provide a Type 3 shutdown on operation of an overcurrent element.
 - l. Under Voltage - Provide a Type 3 shutdown on operation of an under voltage element, 90% of nominal voltage.
 - m. Over Voltage - Provide a Type 3 shutdown on operation of an over voltage element, 110% of nominal voltage.
 - n. Under Frequency - Provide a Type 3 shutdown on operation of an under frequency element, 58.2 Hz.
 - o. Over Frequency - Provide a Type 3 shutdown on operation of an over frequency element, 61.8 Hz.
 - p. Reverse Power - Provide a Type 3 shutdown on operation of a reverse power element, 10%.
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 existing 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 (SMS) is changed from Auto to Manual the alarm lamp shall illuminate. The alarm lamp shall remain illuminated until the SMS 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.

4.9 FEEDER CONTACTOR SEQUENCE OF OPERATION

- A. Automatic Operation - When the System Mode Switch is in the “AUTO” position the feeder contactor shall operate under control of the PLC. The feeder contactor 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 contactor 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 contactor will operate under manual control. The feeder contactor 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 (NOT USED THIS SECTION)

4.11 HEAT RECOVERY SEQUENCE OF OPERATION (NOT USED THIS SECTION)

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 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.
- E. The Developer shall fully test the SCADA system with the switchgear and generating equipment as specified herein and in Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing 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 01 New Prime Power Switchgear
- D. Section 26 23 02 Upgrade Existing 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 Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing 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 Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing 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 Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing 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.
- 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.

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 Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing 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.

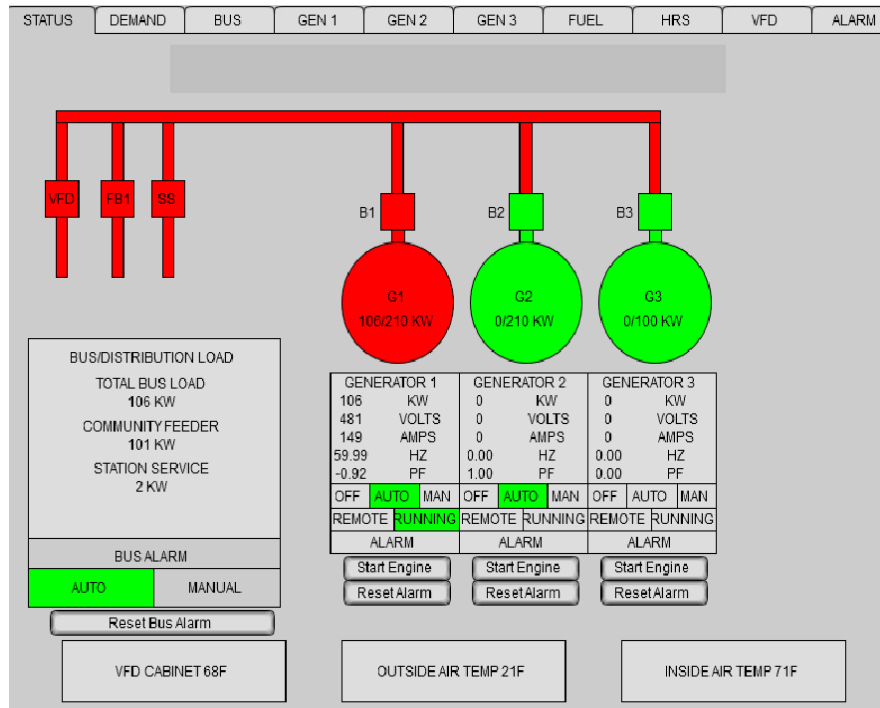
3.2 CUSTOMER TRAINING

- 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.
- 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.

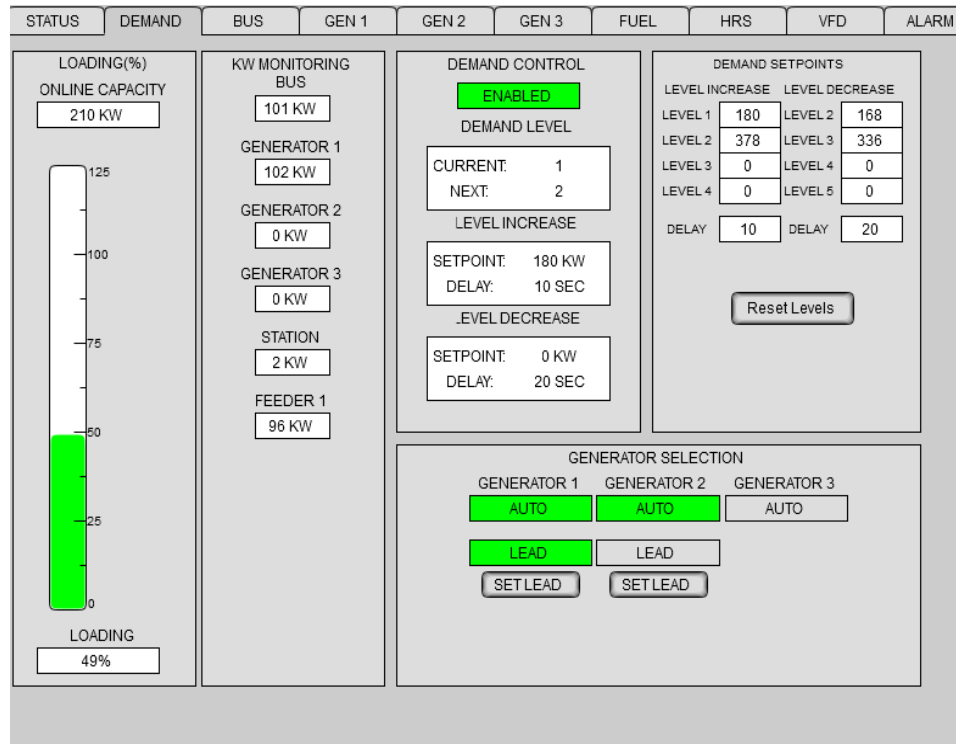
3.3 OIU SCREEN IMAGES

The SCADA system screens shall display all data as specified in Sections 26 23 01 - New Prime Power Switchgear and 26 23 02 - Upgrade Existing Prime Power Switchgear. 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.

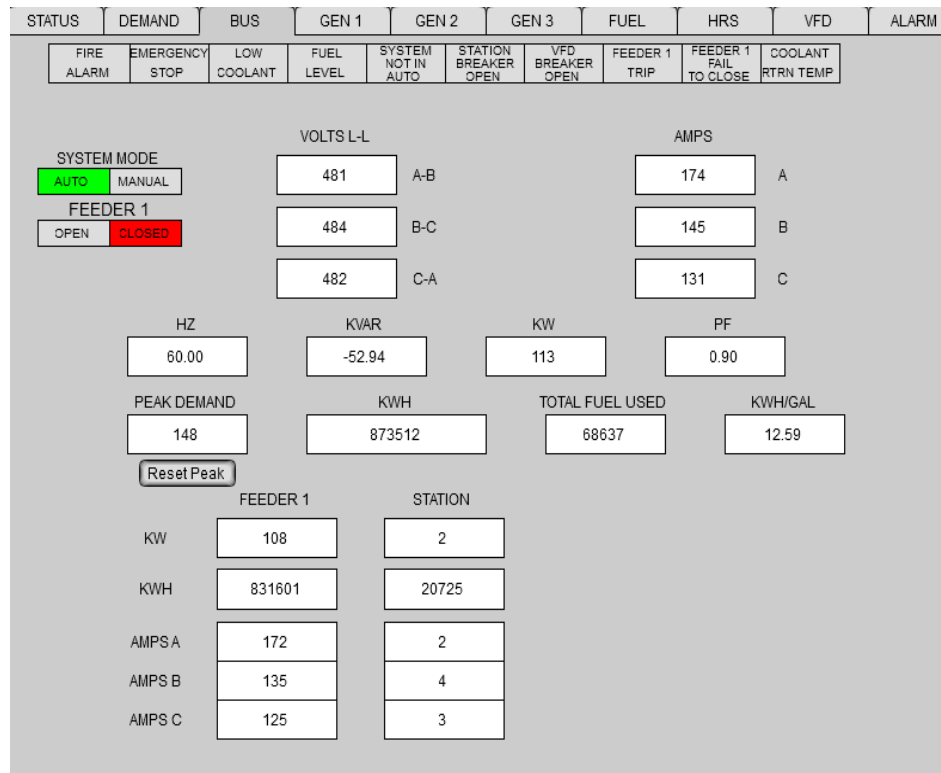
A. Home Screen – Overall Plant Status:



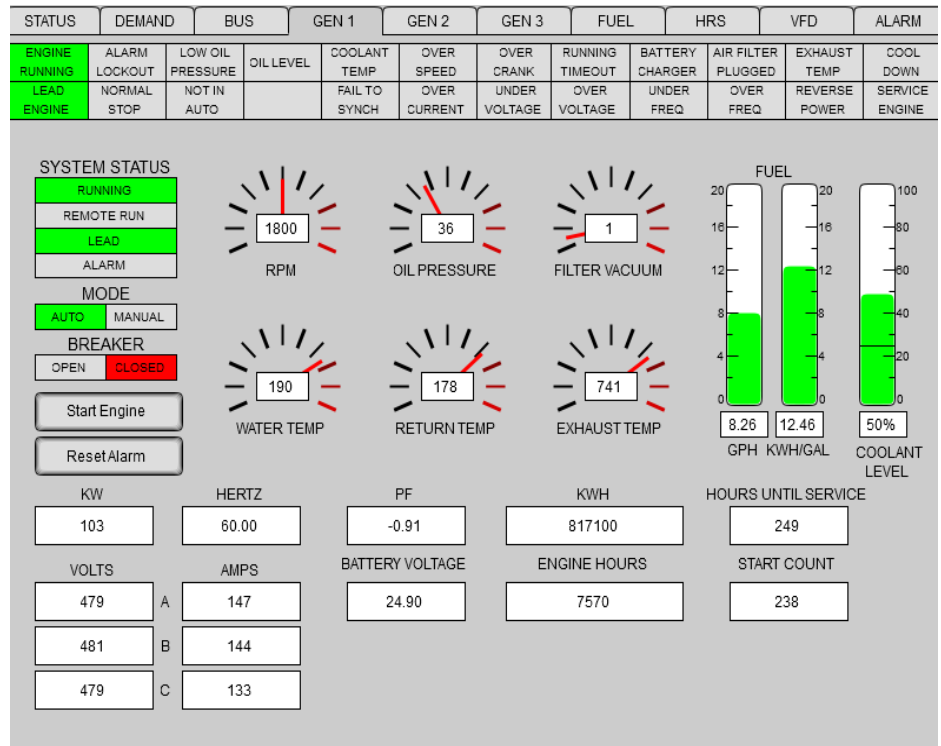
B. Demand Control Screen:



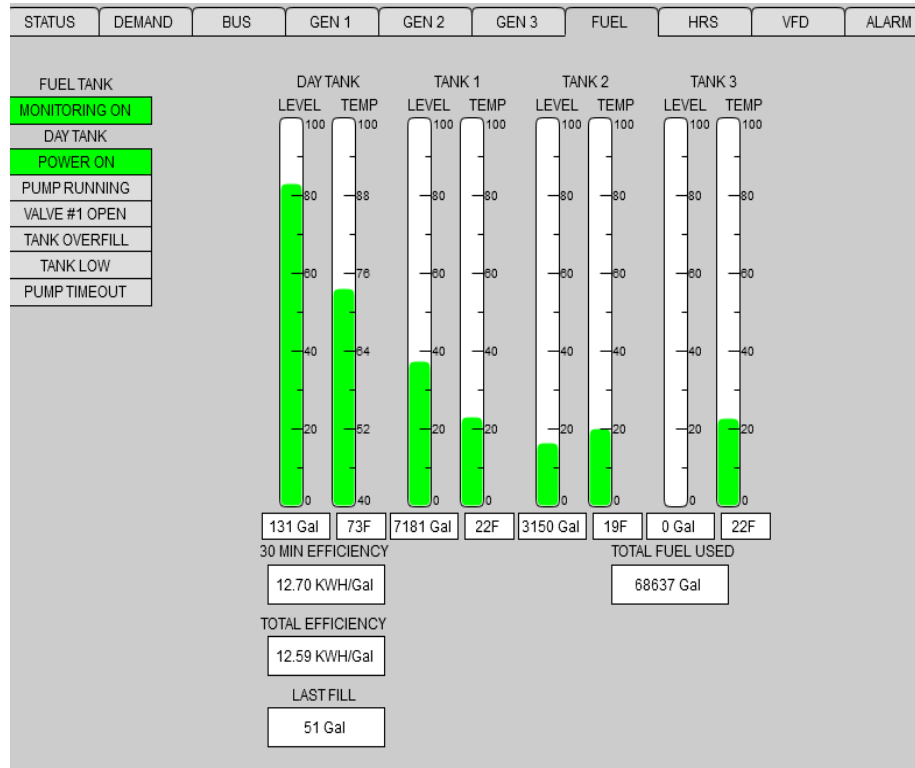
C. Bus Monitoring & Metering Screen:



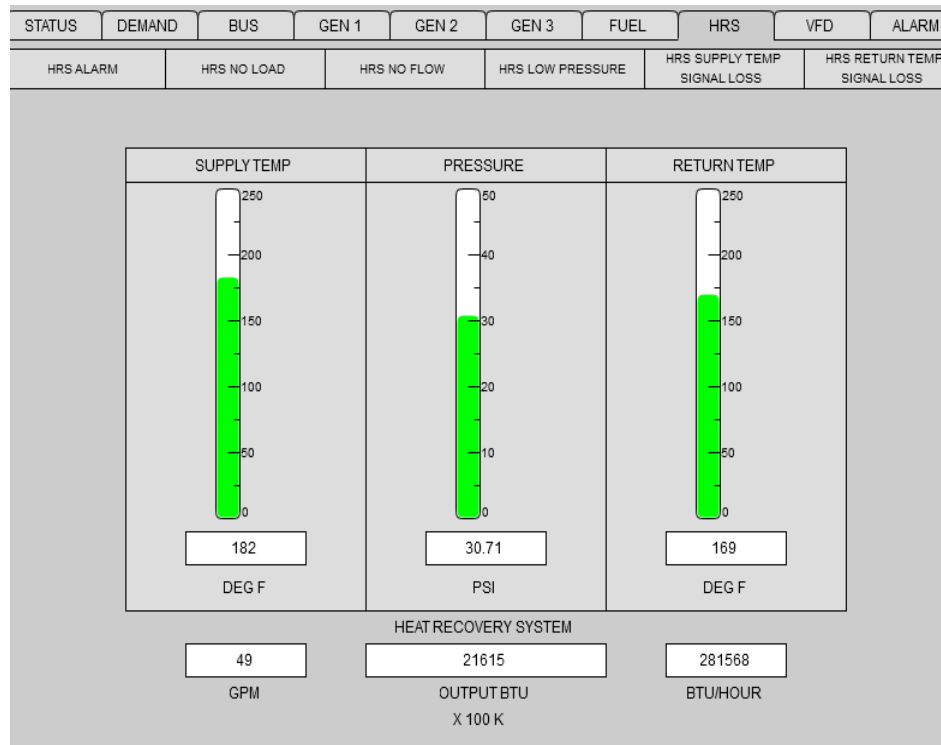
D. Engine-Generator Screen (1 for each genset, 3 total):



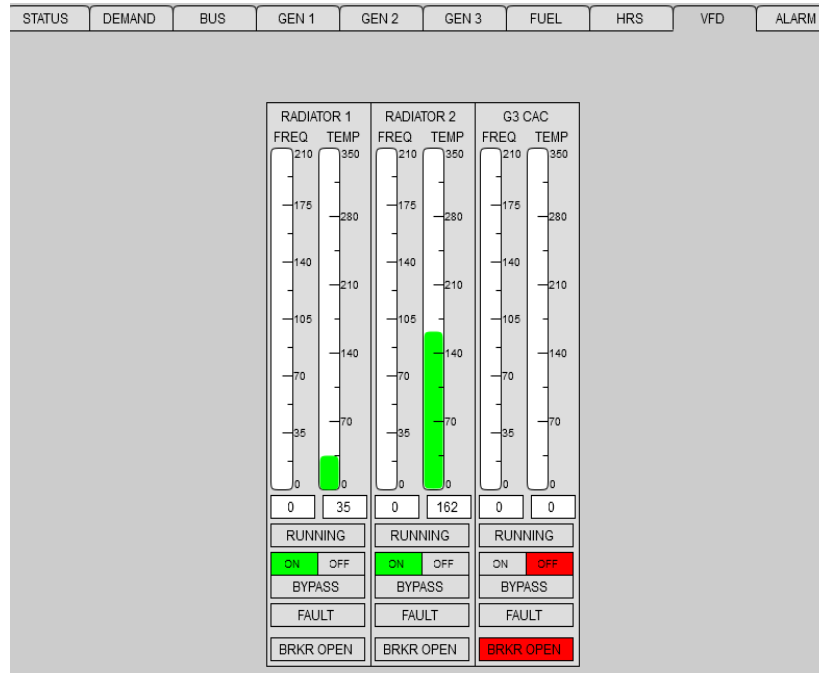
E. Fuel System Monitoring & Alarm Screen:



F. Heat Recovery Monitoring & Metering Screen:



G. Variable Frequency Drive (VFD) Monitoring Screen:



H. Alarm History Screens:

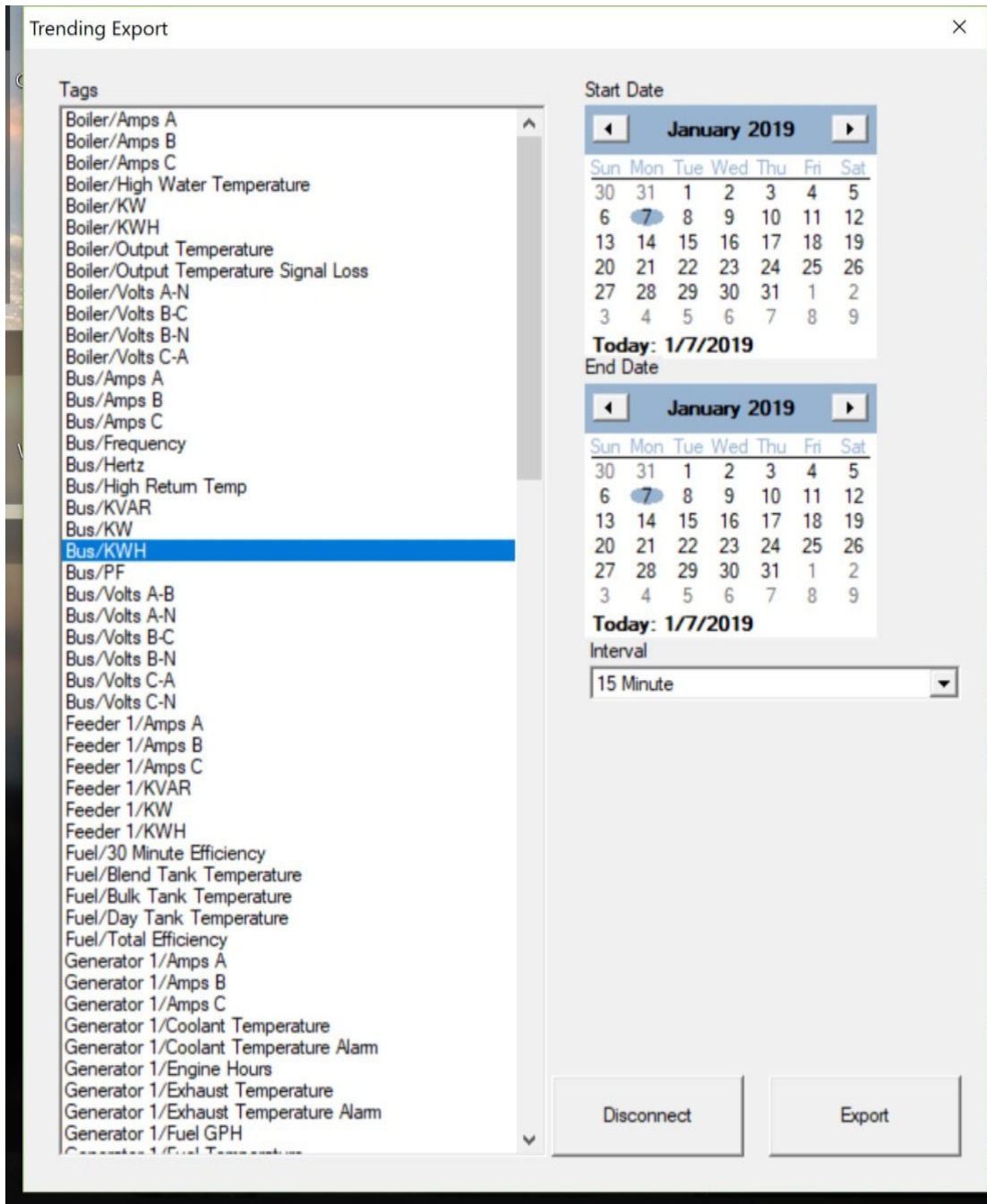
Provide two separate Alarm History Screens, one for Type 1 Soft Shutdown alarms and a second screen for Master Section, Type 2 and Type 3 Alarms. The Type 1 Alarm screen shall use alternating yellow and white lines, as indicated below. The second screen shall use alternating red and white lines.

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 ▶

3.4 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

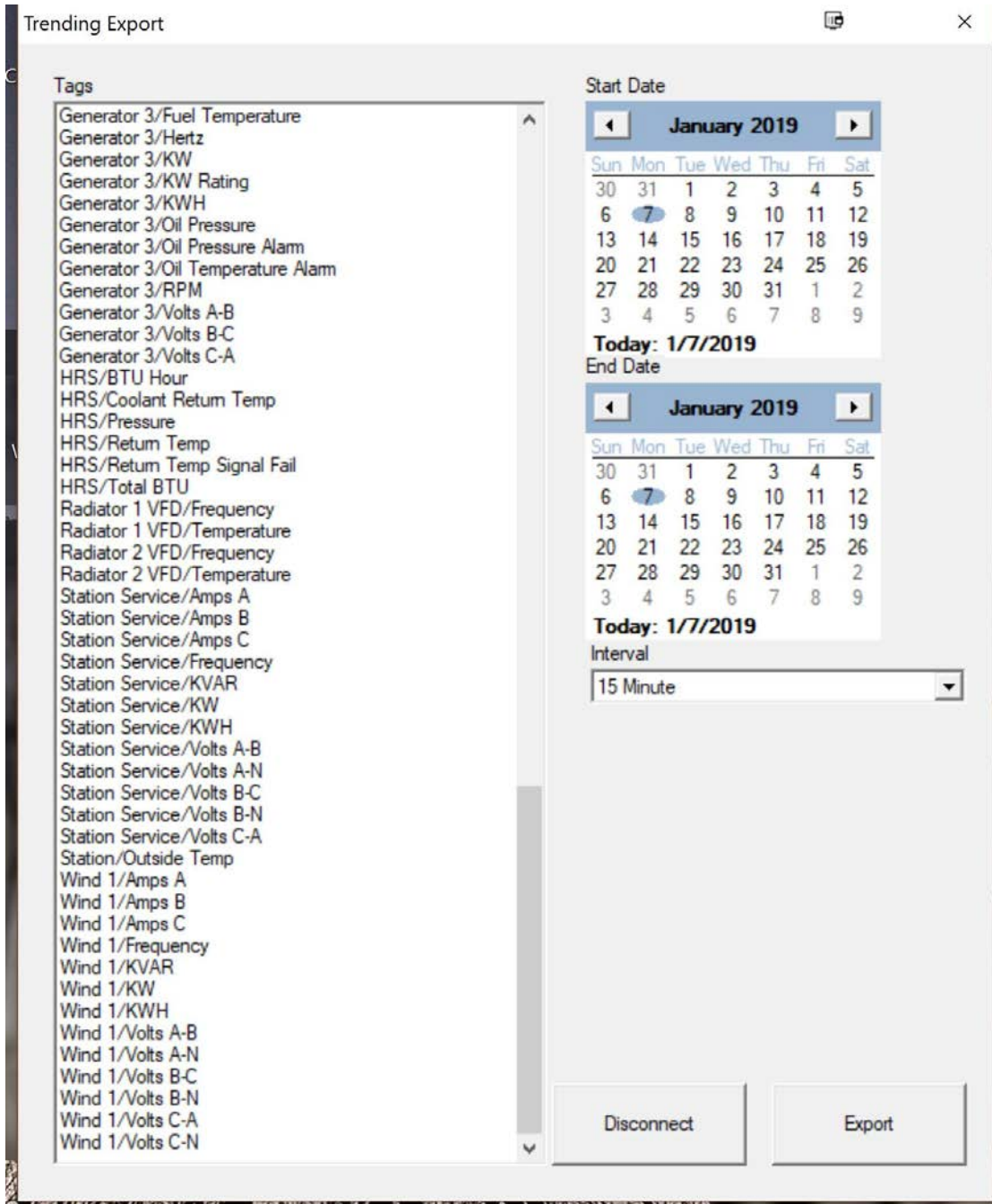
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Today: 1/7/2019

Interval

15 Minute

Disconnect Export



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.

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

Furnish Engine Generators of the capacity and configuration listed below:

Arctic Village Gen #1 & #2

Engine - 223 hp, 150 ekW prime, John Deere 6068AFM85, Tier 3 Marine.
Starting and Control Voltage = 24 VDC.

Generator - Minimum 170kW continuous at 105°C rise, Newage/Stamford UCI274G or Kato equal.

Arctic Village Gen #4

Engine - 148 hp, 100 ekW prime, John Deere 4045AFM85, Tier 3 Marine.
Starting and Control Voltage = 24 VDC.

Generator - Minimum 125kW continuous at 105°C rise, Newage/Stamford UCI274E or Kato equal.

Chenega Bay Gen #1 & #3

Engine - 148 hp, 100 ekW prime, John Deere 4045AFM85, Tier 3 Marine.
Starting and Control Voltage = 24 VDC.

Generator - Minimum 125kW continuous at 105°C rise, Newage/Stamford UCI274E 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 generator as shown on the Drawings. Provide service loops in wiring harnesses as required.
- 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. Provide a ball valve and bulkhead fitting through the side of the skid (Chenega Bay) or a hose for field connection to the plant piping (Arctic Village). See Drawings for specific 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 avoid any low point traps 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, Caterpillar 9X-8124 or approved 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.

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.

- 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):

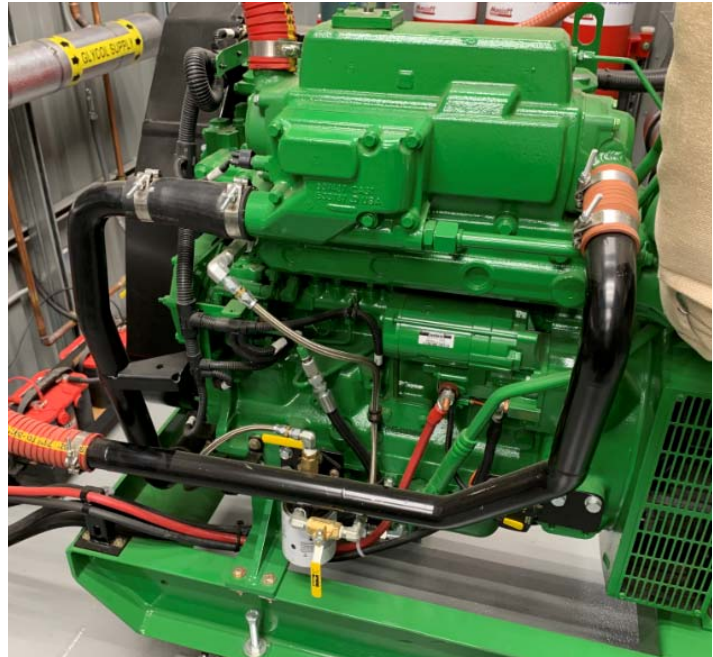
- A. Spring vibration isolators complete with mounting hardware, four (4) per each unit, sized for the complete engine generator unit weight. Caldyn Type RJ or approved equal.
- B. Drip pan, 16-gauge galvanized sheet metal, liquid tight joints, 20" wide by 50" long by 1" high.
- C. Minimum 800 cold crank 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 existing remote radiators 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 below for representative installation.





2. 6068AFM - Remove coolant tank and other accessories that are not required. Modify coolant discharge connection to face vertically at the front of the engine. Modify coolant suction connection to face horizontally at the front of the engine. See photograph below for representative installation.



2.7 INSTRUMENT PANEL

- A. Provide a J1939 multi-function monitoring panel, Murphy PV101-C with non-Tier 4 firmware or approved equal. 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 torqueing.

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. 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 engine and generator mounted 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 disconnecting any control wiring.
- 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.

2.11 PAINTING

Each unit shall be painted John Deere industrial tan 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, exhaust, load bank 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.
- E. Engine Tests: Shop test each engine generator with the associated control wiring junction box permanently connected. 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 Engineer 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 and run for five minutes minimum. 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