Invitation for Bids
Information Package for:

Essex County Government Center
Central Office

Development Authority OF THE North Country

June 20, 2012

SECTION 1.0 NOTICE TO BIDDERS

1. Introduction

The Development Authority of the North Country (Authority) is soliciting bids for constructing a Central Office (CO) located in the Essex County Government Center. A mandatory Pre-Bid Meeting is scheduled for 11:00 a.m. on June 28, 2012 at the Essex County Government Center, 7551 Court Street, Elizabethtown, NY 12932. Bids will be accepted at the Authority's Warneck Pump Station, located at 23557 NYS RT 37, Watertown, New York 13601, until 1:00 p.m. on July 11, 2012. All bids will be opened at 1:00 p.m. on July 11, 2012 at the same location. One contract will be awarded to the lowest responsive and responsible bidder submitting a bid which complies with all requirements. For complete details on the scope of services requested and other requirements please request a copy of the Authority's Invitation for Bids Information Package by contacting Terri Belden via e-mail at tbelden@danc.org or visiting www.danc.org. All bidders must be in compliance with applicable state and federal requirements. The Authority reserves the right to terminate or reduce the scope of the services requested to accommodate budget and/or other business needs. The right is reserved to waive any informalities and to reject any or all bids.

- Bid #: OATN 2012-28
- Description: Essex County Government Center Central Office

SECTION 2.0 GENERAL INSTRUCTIONS

1. Read this entire IFB carefully and provide all requested information. Failure to meet any requirements shall be cause to disqualify a vendor.

2. Read all the "Standard Terms and Conditions" and "Standard Clauses for Authority Contracts" attached. They govern this bid and the resulting purchase contract.

3. Contractor is responsible for obtaining a building permit.

4. For all services contracted with the Authority the successful contractor shall procure and maintain insurance satisfactory to the Authority in the following coverage and amounts:

    a. Comprehensive General Liability including personal injury coverage of $1,000,000 per occurrence in the aggregate.

    b. Property damage in the amount of $500,000 per aggregate and $1,000,000 in the aggregate.

    c. Automobile coverage with combined single limit of $1,000,000.

    d. Statutory Workers' compensation and disability coverage.

    e. Contractor may provide an umbrella policy to meet limits as set forth above.

    f. The successful contractor shall arrange with its insurance carrier to have Development Authority of the North Country, and its officers, employees, and agents listed as additional named insured on all certificates of insurance required for performance of this contract and shall provide proof acceptable to the Authority that those amendments to the insurance contract have been accomplished.

5. A one year warranty of workmanship and materials is required.

6. Prevailing wage rates apply to this project.

7. The Development Authority is tax exempt.

8. Project shall be completed within 30 days from notice to proceed.

9. Project work hours will be 7:00 a.m. to 3:30 p.m. Monday through Friday.

10. Contractors must comply with the Authority's "Contractor Rules and Responsibilities". The relevant sections of this document have been included at the end of this IFB Package for reference. The Authority project manager will review contractor rules and responsibilities document with the successful bidder at time of pre-construction meeting.

11. OSHA 10 Hour Occupational Safety and Health Certificates are required for all contractors.

12. As-built drawings, equipment manuals, and O&Ms shall be submitted in electronic format in addition to 1 hard copy prior to release of final payment.

13. Anyone considering bidding must send an email to the contact listed in this bid document. The purpose of this email is to provide your contact information so that you can be notified of any changes prior to the deadline for receipt of bids. Failure to do so absolves the Authority of all responsibilities for notification of changes and bidders will be responsible for any errors in such bids due to such change

14. Bid must be provided in a sealed, opaque envelope clearly marked with the following:

_____

Vendor Name and Address

Terri Belden, Engineering Assistant
Development Authority of the North Country
Warneck Pump Station
23557 NYS Route 37
Watertown, New York 13601

Attention: Essex County Government Center CO

_____

15. The enclosed "Essex County Government Center CO" Bid form must be completed and returned with the bid.

16. Bid package must include: a non-collusive bidding certificate, price bid form, certification pursuant to executive order No. 127, and complete details of any exceptions taken.

17. All bids must be signed and dated by an authorized representative of the vendor.

18. Any questions regarding this IFB shall be in writing and directed by e-mail to:

- Terri Belden, Engineering Assistant
- Email – tbelden@danc.org

SECTION 3.0 SPECIFIC INSTRUCTIONS AND INFORMATION

3.1. Central Office Construction Details

1. Remove all existing wall board and replace with new ½" gypsum wall board.

2. Remove all existing suspended ceiling panels.

3. Install new suspended ceiling panels.

4. Prep and paint new suspended ceiling tile with flat black paint.

5. Prep and paint walls with flat black paint starting from ceiling down walls 18".

6. Paint remaining wall surfaces flat off white.

7. Prep and install new 1' X 1' VCT floor tile in entire CO room.

8. Provide and install new 200amp, 208v single phase sub panel with six (6) 25amp and three (3) 15amp circuit breakers. See attached Electrical General Requirements.

9. Provide and install one (1) new 25KW propane generator equipped with programmable transfer switch to serve Essex County data center and DANC Telecom Central Office. See attached specifications for generator & Transfer switch.

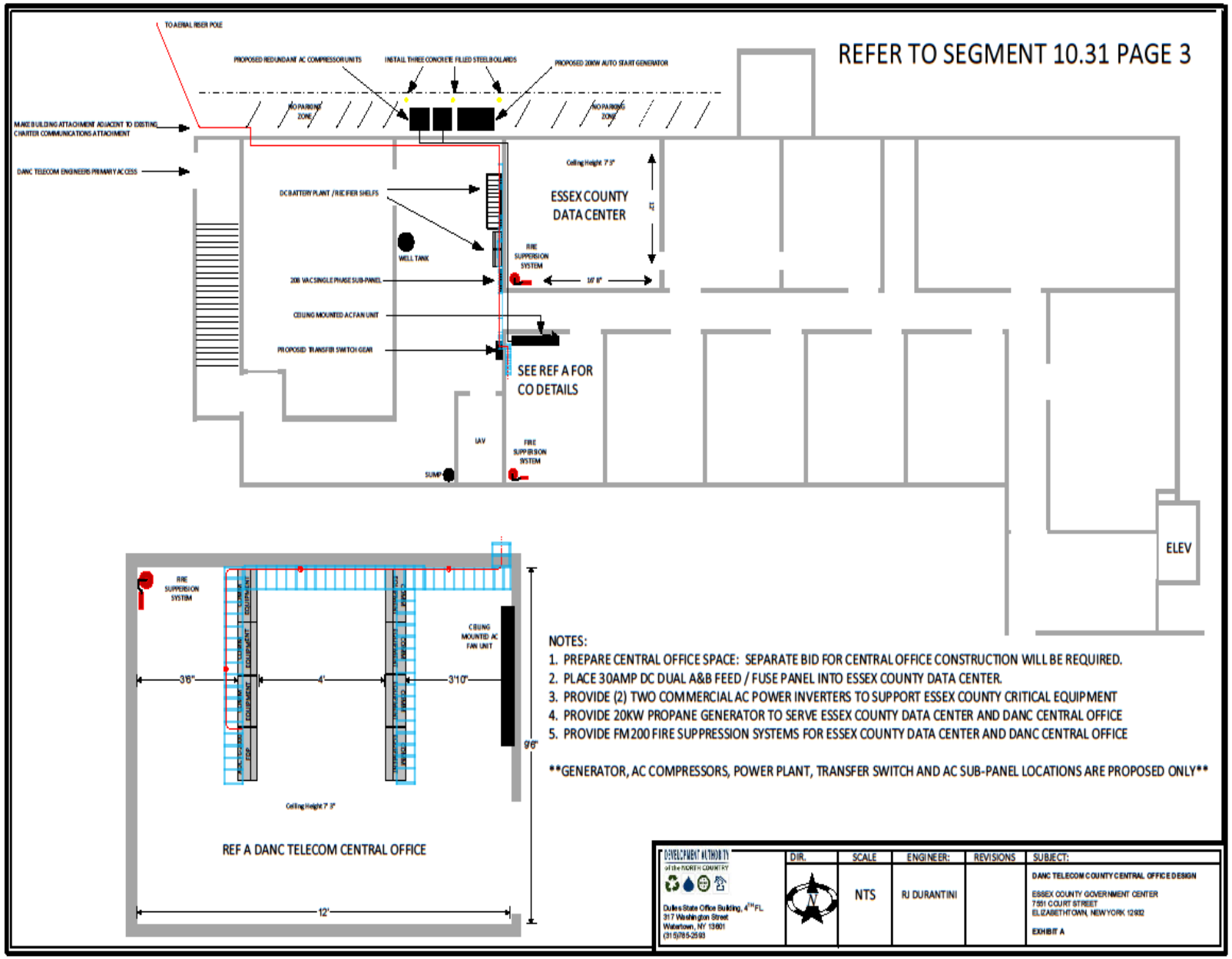
10. Provide and install two (2) split air conditioning units to serve DANC Telecom Central Office. See attached air conditioner specifications.

11. Provide and install two (2) commercial AC power inverters to support Essex County critical equipment.

12. Provide and install 30amp DC dual A&B feed fuse panel into Essex County data center.

13. Provide and install secondary containment piping system (i.e., Contain-It sanitary piping as manufactured by George Fischer @ George Fischer LLC - Products, or approved equivalent) for existing overhead piping in CO, to protect Telecom equipment from water damage.

14. Submittals are required for Split AC systems, Electrical sub panel, Propane generator, Transfer Switch, 30 amp DC fuse panel, and secondary containment piping.


REFER TO SEGMENT 10.31 PAGE 3
TO AERIAL RISER POLE
PROPOSED REDUNDANT AC COMPRESSOR UNITS
INSTALL THREE CONCRETE FILLED STEEL BOLLARDS
PROPOSED 20KW AUTO START GENERATOR
NO PARKING ZONE
NO PARKING ZONE
MAKE BUILDING ATTACHMENT ADJACENT TO EXISTING CHARTER COMMUNICATIONS ATTACHMENT
DANC TELECOM ENGINEERS PRIMARY ACCESS
DC BATTERY PLANT / RECIFIER SHELFS
ESSEX COUNTY DATA CENTER
Ceiling Height 7' 5"
41'
WELL TANK
FIRE SUPPERSION SYSTEM
208 VAC SINGLE PHASE SUB-PANEL
10' 8"
CEILING MOUNTED AC FAN UNIT
PROPOSED TRANSFER SWITCH GEAR
SEE REF A FOR CO DETAILS
IAV
FIRE SUPPERSION SYSTEM
SUMP
ELEV
FIRE SUPPERSION SYSTEM
CEILING MOUNTED AC FAN UNIT
3'6"
4'
3'10"
9'6"
Ceiling Height 7' 3"
REF A DANC TELECOM CENTRAL OFFICE
12'
NOTES:
1. PREPARE CENTRAL OFFICE SPACE: SEPARATE BID FOR CENTRAL OFFICE CONSTRUCTION WILL BE REQUIRED.
2. PLACE 30AMP DC DUAL A&B FEED / FUSE PANEL INTO ESSEX COUNTY DATA CENTER.
3. PROVIDE (2) TWO COMMERCIAL AC POWER INVERTERS TO SUPPORT ESSEX COUNTY CRITICAL EQUIPMENT
4. PROVIDE 20KW PROPANE GENERATOR TO SERVE ESSEX COUNTY DATA CENTER AND DANC CENTRAL OFFICE
5. PROVIDE FM200 FIRE SUPPRESSION SYSTEMS FOR ESSEX COUNTY DATA CENTER AND DANC CENTRAL OFFICE
GENERATOR, AC COMPRESSORS, POWER PLANT, TRANSFER SWITCH AND AC SUB-PANEL LOCATIONS ARE PROPOSED ONLY
DEVELOPMENT AUTHORITY of the NORTH COUNTRY
Dulles State Office Building, 4TH FL.
317 Washington Street
Watertown, NY 13601
(315)785-2593
DIR.
SCALE
NTS
ENGINEER:
RJ DURANTINI
REVISIONS
SUBJECT:
DANC TELECOM COUNTY CENTRAL OFFICE DESIGN
ESSEX COUNTY GOVERNMENT CENTER
7551 COURT STREET
ELIZABETHTOWN, NEW YORK 12932
EXHIBIT A

Essex County Government Center CO Bid Form

1. Date ___/___/___
2. Vendor Name: _____
3. Vendor Address: _____

   _____

   _____

4. Bid Amount: $ _____

BIDDER INFORMATION & CERTIFICATION FORM

BID FOR: Essex County Government Center CO

TO: THE DEVELOPMENT AUTHORITY OF THE NORTH COUNTRY (DANC):

The signer of this Bid declares and certifies that he or she is fully authorized to submit this bid and thereby bind the person, persons, company, parties or entity named in this Bid, and on whose behalf this Bid is submitted; that the Bid is in all respects accurate, complete and without known mistakes.

If written notice of the acceptance of this Bid is mailed or delivered to the undersigned within forty-five (45) days after the date of review of the Bid, or any time thereafter before this Bid is withdrawn, the undersigned will, within five (5) days after the date of such mailing or delivering of such notice, sign and execute the Contract and return it to the Authority.

Pursuant to and in compliance with your Advertisement for Invitation for Bid and the IFB Information Packet relating thereto, the undersigned hereby offers to furnish all labor, materials, supplies, equipment, services and other things required, necessary or proper for, or incidental to the completion of the items identified in the solicitation for bids.

Authorized Signature: _____ Date:_____

Type Written Name:_____

Title:_____

Company Name: _____

Address: _____

_____

Federal Identification No: _____

Area Code/ Telephone No:_____

Area Code/Fax Number:_____

E-Mail Address:_____

Web Site: _____

NON-COLLUSIVE BIDDING CERTIFICATE

(a) By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

1. The prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this Bid have not been knowingly, disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and

3. No attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

(b) A Bid shall not be considered for award nor shall any award be made where (a) 1., 2., and 3., above have not been complied with; provided, however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish with the Bid a signed statement which sets forth in detail the reasons therefore. Where (a) 1., 2., and 3., above have not been complied with the Bid shall not be considered for award nor shall any award to be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the Bid is made, or his designee determines that such disclosure was not made for the purpose of restricting competition.

(c) The fact that a Bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being Bid, does not constitute, without more, a disclosure within the meaning of paragraph (a) of this certification.

(d) Any Bid hereafter made to any political subdivision of the State or any public department, agency or official thereof by a corporate Bidder for work or services performed or to be performed or goods sold or to be sold, where competitive Bid is required by statute, rule, regulation, or local law, and where such Bid contains the certification referred to in subdivision one of the section, shall be deemed to have been authorized by the board of directors of the Bid, and such authorization shall be deemed to include the signing and submission of the Bid and the inclusion therein of the certificate as to non-collusion as the act and deed of the corporation.

Company Name: _____

By: _____

Title: _____

CERTIFICATION PURSUANT TO EXECUTIVE ORDER NO. 127

The following persons or organizations are or will be retained, employed or designated on behalf of the Bidder to attempt to influence this procurement process, involving an interest in the Authority's real property, with their financial interest noted:

If no individuals are or will be retained, employed or designated on behalf of the Bidder as described above, then check this box ☐ and sign the form below.

Name, Address and Phone Number	Place of Principal Employment	Occupation	Financial Interest (Yes or No)
1)			
2)			
3)			
4)			
5)			
6)			

The Bidder shall notify the Authority, in advance, or additions to this list. The Bidder has not, within the past five (5) years, received a finding of non-responsibility by any State agency due to intentionally providing false or incomplete information with respect to Executive Order No. 127.

Certification, The Bidder certifies that all information provided under Executive Order No. 127 is complete, true and accurate.

_____

Bidder Signature

Development Authority of the North Country Contractor Rules & Responsibilities

1.0 Contractor's Responsibilities

Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks, such as confined space entry and non-routine repair activities, their work must be controlled. This document is intended to provide supplemental information to contractors working on Authority premises. All contractors are responsible for following all applicable federal, state and local safety protocol.

Prior to beginning work, all contractors working at the Authority facilities are expected to:

- Assure that their employees are trained in the work practices necessary to safely perform the job.
- Instruct employees in the potential fire, explosion, or toxic release hazards associated with this contract.
- Assure the employee knows the applicable provisions of the emergency action plan for medical emergencies, fire, chemical spills, and evacuation.
- Inform employees of applicable safety rules of this facility, particularly those implemented to control the hazards of the contracted process during operations such as Lockout/Tagout, Welding Permits, Confined Space Entry, and Fall Protection.
- Require that all sub-contractors abide by the same rules to which this section binds the contractor.
- Inform employees of applicable environmental rules of the facility to ensure minimal impact on the environment.

2.0 General DANC Safety & Environmental Rules

Contractors will follow all applicable safety regulations including but not limited to the following General Authority Safety & Environmental Rules:

- Have a designated site safety representative present and attentive to work crew activities.
- Establish the necessary safe practices to permit safe working conditions for Authority employees and property. (This includes, but is not limited to: barricading, sign posting, and fire watches.)
- Provide employees with medical care and first aid treatment. Authority first aid facilities may be used only in case of emergencies.
- Provide all tools and equipment for the work, including personal protective equipment (PPE).
- Maintain good housekeeping at the work site.
- Follow specific instructions supplied by this company should emergency alarms be activated.
- Notify the Authority Project Manager immediately of any OSHA recordable

injury or illness to contractor employees or sub-contractor employees.

- Follow the Authority's written safety policies and procedures specific to the work being performed.
- Use of any Authority owned vehicle is prohibited unless prior approval is granted (fork truck, aerial lifts etc.).
- Use of compressed air for blowing off clothing, hair, face, or hands is strictly forbidden.
- All containers and chemicals not in their original container must be identified with a HMIS label.
- All drop cords, hoses, welding leads, etc., must be elevated to a minimum of seven (7) feet above all pedestrian traffic areas or secured to avoid tripping hazards.
- Ground fault circuit interrupters must be used on all electrical equipment used in confined space entries, and in "wet" environments.
- Authorized work permits MUST be obtained prior to doing the following:
- Cutting/burning/welding or use of sparking tools
- Entry of a confined space
- Materials must be secured and properly stored.
- Immediately clean spills and mark any wet or slippery walking or working surfaces.
- Clean work areas of all excess work materials, equipment, and debris on a daily basis.
- Arrange work materials and equipment as to not block aisles, electrical panels or emergency equipment or exits.
- Compressed gas cylinders must be secured, tagged, and have protective caps in place when not in use.
- Ensure that OSHA equipment inspections and inspection reports are maintained.
- Follow the DANC environmental policies and procedures specific to the work being performed as follows:
- Avoid discharge of any chemical to plant process or storm drains without prior approval by the Project Coordinator.
- Notify the Project Coordinator immediately of any spills or releases to the environment.
- Follow the conditions specified in environmental permits, if required.
- Handle hazardous waste in accordance with RCRA regulations.
- Qualified DANC employees may provide emergency first aid treatment under the Good Samaritan Act in life threatening situations.

3.0 Record Keeping Requirements

The contractor is expected to:

- Keep records of all training done with contract workers and all documentation provided to the contracting company regarding such training.
- Have on file the emergency response procedures outlined in this document.
- Provide copies of all material safety data sheets (MSDS) or other required information about chemicals relevant to the work on-site prior to beginning work.
- Keep an OSHA recordable injury and illness log for the project, as well as copies of accident reports on all accidents that occur in the course of the project.

I have completely read this document and have a clear understanding of the requirements established for each of the following elements of this plan:

- Contractor Responsibilities
- General Safety & Environmental Rules
- Record Keeping Requirements

I also understand that I am responsible for following all applicable federal, state and local safety protocol and that the Development Authority of the North Country assumes no liability or responsibility for contractor safety.

Failure to comply with these safety and environmental policies or procedures may result in the immediate disqualification of the present contract and any future contracts with this facility.

Contractor Supervisor

Name (printed): _____ Signature:_____
Date:_____

Contract Employees Working on DANC Project

Name (print)	Name (signature)

Authority Project Manager
Signature:_____

Date: _____

Form 4

Contractor Accident Reporting Form

THIS FORM MUST BE COMPLETED AND RETURNED TO AUTHORITY PROJECT MANAGER WITHIN 24 HOURS OF ACCIDENT AND IS REQUIRED FOR ANY ACCIDENT INVOLVING A *CUSTOMER, VENDOR, OR VISITOR.*

DATE OF ACCIDENT:_____ TIME OF ACCIDENT:_____

LOCATION OF ACCIDENT: ☐ SWMF (LANDFILL) ☐ WATER/SEWER ☐ OATN FACILITY ☐ STATE OFFICE BUILDING

SPECIFIC AREA WHERE ACCIDENT OCCURRED:_____

TYPE OF ACCIDENT: ☐ VEHICLE ☐ NON-VEHICLE

DAMAGE INVOLVED? ☐ PROPERTY ☐ PERSONAL INJURY

PERSON(S) INVOLVED IN ACCIDENT:_____

DESCRIPTION OF THE ACCIDENT: _____

_____

IF APPLICABLE, BREIFLY DESCRIBE ROAD AND WHETHER CONDITIONS AT TIME OF ACCIDENT:

_____

_____

CONTRACTOR/VENDOR/VISITOR'S STATEMENT:

_____

_____

SIGNATURE: _____ DATE: _____

DANC PROJECT MANAGER'S COMMENTS:

_____

_____

SIGNATURE: _____ DATE: _____

DIVISION MANAGER'S SIGNATURE:_____DATE: _____

PART 1 – GENERAL

General Electrical Requirements

PART 1

PART 1 DESCRIPTION:

1. Under this Section, the Contractor shall furnish all labor, materials and equipment for Electrical General Requirements as specified and/or directed.

2. REFERENCES:

The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

a. Federal Specification (Fed. Spec.):
   - L-P-387A Plastic Sheet, Laminated, Thermosetting (for Design Plates)

b. American National Standards Institute (ANSI) Publications:
   - C37.20 Switchgear Assemblies, Including Metal-Enclosed Bus
   - Z35.1 Accident Prevention Signs

c. Institute of Electrical and Electronics Engineers (IEEE) Publication:
   - 100 Standard Dictionary of Electrical and Electronics Terms

d. National Electrical Manufacturers Association (NEMA) Publication:
   - ICS 6 Enclosures for Industrial Controls and Systems

e. National Fire Protection Association (NFPA) Publications:
   - 70B Electrical Equipment Maintenance
   - 70 National Electrical Code

3. DEFINITION OF ELECTRICAL TERMS:

Unless otherwise specified or indicated, electrical terms used in these Specifications, shall be as defined in IEEE Standard No. 100.

4. SUBMITTALS:

Obtain approval before procurement, fabrication, or delivery of items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Military, industry, and technical society publication references, and other information necessary to establish contract compliance of each item to be furnished. Furnish a minimum of three (3) copies of shop drawings for each major device specified.

a. Shop Drawings: In addition to the requirements specified elsewhere, shop drawings shall meet the following requirements. Drawings shall be a minimum of 8.5 inches by 11 inches in size, except as specified otherwise. Drawings shall include complete ratings information, wiring diagrams, and installation details of equipment indicating proposed location, layout and

arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.

b. Manufacturer's Data: Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.

c. Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters' Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. In lieu of the label or listing, submit a certificate from an approved independent testing organization, adequately equipped and competent to perform such services, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's publication.

d. Submittals Required: Supply shop drawing submittal information on the equipment as noted in each individual Section.

5. OPERATION AND MAINTENANCE MANUAL:

Submit as required for systems and equipment indicated in the technical sections. Furnish three copies, bound in hardback binders or an approved equivalent. Furnish one complete manual prior to performance of systems or equipment tests, and furnish the remaining manuals prior to contract completion. Inscribe the following identification on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment. Include a table of contents and assemble the manual to conform to the table of contents, with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include:

a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment.
b. A control sequence describing startup, operation, and shutdown.

c. Description of the function of each principal item of equipment.
d. Installation and maintenance instructions.
e. Safety precautions.
f. Diagrams and illustrations.
g. Testing methods.
h. Performance data.
i. Lubrication schedule including type, grade, temperature range, and frequency.
j. Parts list. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
k. Appendix: List qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

6. SPARE PARTS:

Provide the following spare parts for all equipment installed under this Contract, unless indicated otherwise elsewhere.

a. Three (3) fuses for each different size and type used.

7. LAYOUT OF THE WORK:

Coordinate the proper relation of the work to the building structure, existing utilities and to the work of all trades. The Contractor shall advise the Owner's Representative of any discrepancy before performing any work.

a. Contract Drawing: The Contract Drawing represents the general intent as to layout and equipment arrangements. All locations and dimensions shown shall be field verified and minor alterations made if so required. Where dimensions are not given for the location and arrangement of mechanical systems, locations may be assumed to be approximate, and may be altered if required. Major modifications to the indicated arrangements shall be approved by the Owner's Representative prior to the installation of mechanical systems. Schematic diagram represents the overall system requirements and do not necessarily indicate the physical orientation, location or dimensions of that system.

    - The Owner or Engineer does not warranty the accuracy of any background drawings provided and the Contractor shall be responsible to field verify all background drawings.

b. Record Drawings: The Contractor shall maintain a record of the progress of the work and shall submit three (3) sets of As-Built Drawings upon completion of the project.

8. POSTED OPERATING INSTRUCTIONS:

Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

9. INSTRUCTION TO OWNER'S PERSONNEL:

Where indicated in the technical sections, furnish the services of competent instructors to give full instruction to Owner's personnel in the adjustment, operation, and maintenance of systems and equipment, including pertinent safety requirements as required. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of man days (8 hours) of instruction furnished shall be as specified in each individual section.

10. DELIVERY AND STORAGE:

Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B, Appendix I, titled "Equipment Storage and Maintenance During Construction". Replace damaged or defective items with new items.

a. Protection of Personnel: Where the safety of non-contractor personnel is endangered in the area of the work, barricades shall be used. Additional protection shall be provided if required, to preserve the safety of non-contractor personnel in the immediate area of the work.

11. CATALOGED PRODUCTS/SERVICE AVAILABILITY:

Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar

circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the Contract.

12. MANUFACTURER'S RECOMMENDATIONS:

Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material. Obtain manufacturer's recommendations from the Owner for equipment and/or material provided by the Owner. All installations shall be per the NEC, manufacturer’s written installation instructions and all applicable codes and regulations

13. MOTORS AND MOTOR CONTROLS FOR MECHANICAL EQUIPMENT:

The electrical components of mechanical equipment, such as motors, motor starters, control or push button stations, float or pressure switches, solenoid valves, and other devices functioning to control mechanical equipment, and control wiring and conduit for circuits rated 100 volts or less, are specified in the section covering the associated mechanical equipment. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, and the electrical power circuits shall be furnished and installed.

Products

PART 2

PART 2 DESCRIPTION:

1. MATERIALS AND EQUIPMENT:

All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All items shall be new unless specified or indicated otherwise.

2. NAMEPLATES:

Fed. Spec. L-P-387. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device.

a. Each nameplate inscription shall identify the function and, when applicable, the position.
b. Nameplates shall be melamine plastic, 0.125-inch thick, white with black center core.
c. Surface shall be matte finish.
d. Corners shall be square.
e. Accurately align lettering and engrave into the black core.
f. Minimum size of nameplates shall be 1.0 inch by 2.5 inches.
g. Lettering shall be a minimum of 0.25-inch high normal block style.

3. ARC FLASH HAZARD MARKING:

Provide Arc flash warning labels for all new or modified electrical equipment.

a. Electrical equipment shall include VFDs, panelboards, control panels, automatic transfer switches, generator main breakers, switches, and any other devices which are likely to require examination.
b. Arc flash warning labels shall be provided in compliance with Article 110.16 of the NEC (2008).
c. Labels shall be catalog No. 94913 as manufactured by Brady, or approved equal.
d. Labels shall be a minimum of 3”H x 4”W and approved for indoor use.
e. Labels affixed to equipment enclosures rated NEMA 3R, 4, 4X, 6, or 8 shall be rated for outdoor use.

Execution

PART 3

PART 3 DESCRIPTIONS:

1. NAMEPLATE MOUNTING:

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

2. PAINTING OF EQUIPMENT:

a. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.

3. TESTS:

a. General: Perform and record all tests in the presence of the Owner's authorized representative and/or the Engineer. Furnish all instruments and personnel. Perform preliminary tests and correct all defective material and/or workmanship prior to witness of tests.

b. Conduct field tests in the sequence listed below:

1. Insulation Resistance Tests: Make tests after all wiring is completed and connected ready for the attachment of fixture and/or equipment. Repeat test when all fixtures and/or equipment are connected ready for use. Make tests with an instrument capable of measuring the resistance involved at a voltage of at least 500 volts DC for equipment rated 100 to 500 volts AC, 1500 volts DC for equipment rated 151 to 600 volts AC. Apply voltage continuously for one minute prior to taking reading. Measure insulation resistance between each pair of insulated conductor separately and between each insulated conductor and ground. Make tests at each panelboard distribution panel, and switchboard on every circuit with the circuit protective device open but connected. The minimum acceptable measured insulation resistance for wiring completed and ready for connection of fixtures and/or equipment is 1,000,000 ohms.

2. Load Balance Test: Make test by energizing all lighting, motors and other electrical equipment simultaneously for a three hour period. Alter fuses, circuit breakers, circuit connections, etc., as required for satisfactory performance. Take voltage and amperage readings on each circuit at all panels.

3. Check the amperage draw, voltage and direction of rotation of each motor in the presence of the equipment contractor and the Owner's

representative. Make all necessary changes to obtain proper rotation, motor terminal voltage, motor protection, etc. Revise heater elements as necessary for proper motor protection. Similarly check all other electrically connected equipment.

4. Make the test at a time during the day or night that is mutually satisfactory to the Owner at least one week prior to substantial completion. Make all arrangements and notify all parties in writing at least seventy-two hours prior to the test.

5. Equipment Operation Test: Show by demonstration in service that all circuits are in good operating condition. Cycle all control equipment under load at least five times.

6. Equipment and Apparatus Factory Tests: Manufacturer's normal quality control tests are acceptable, unless specific factory witnessed tests are specified in other sections.

4. CLEANING:

Just prior to final acceptance clean all equipment including, but not limited to, the following:

- Lighting fixtures, panelboards, receptacles and switch plates
- Remove all tags and labels; leave ready for use
- All equipment to be painted, removing all rust, etc., and leave ready for painting
- Building by removing all debris, conduits, wire, insulation, cartons, etc., left as a result of this work

5. ELECTRICAL INSTALLATION INSPECTION:

Contractor shall provide and pay for inspection of electrical work by an approved electrical inspection agency prior to placing any electrical system into service and prior to turn over of systems to Owner. The contractor will coordinate and provide all utility required documentation for the installation of the new emergency generator system.

Emergency Generator System

PART 1

PART 1 DESCRIPTION: GENERAL

1. Under this Section, the Contractor shall furnish all labor, materials, equipment and accessories for Emergency Generator Systems, as specified and/or directed.

    a. Contractor to confirm service voltage and grounding arrangement prior to purchasing of equipment.

    b. As applicable, system shall be complete including fuel transfer piping, batteries and charger, insulated exhaust piping and muffler, control devices and other equipment and accessories as specified herein and/or as shown.

    c. The equipment for the Emergency Generator Systems shall include, but not limited to, the following:

        1. 25 KW - 208 volt - 1 phase - 3 wire, 12 lead alternator re-connectable, propane generator unit
        2. Fuel transfer piping
        3. Batteries and charger
        4. Insulated exhaust piping and muffler
        5. Installation and initial start-up and training
        6. Spill clean-up materials and cabinet
        7. Block heater
        8. Cooling system
        9. Weatherproof outdoor enclosure
        10. Emergency sub panel
        11. Feeder and branch circuits
        12. Generator start circuit

    d. The work shall also include all controls, accessories, appurtenances or other work required for a complete operating installation.

2. REFERENCES:

The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only and shall be the most current version.

a. American Institute of Steel Construction (AISC) Publication:
Specification for the Design, Fabrication and Erection of Structural Steel for Buildings

b. American National Standards Institute, Inc. (ANSI) Publications:

- B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)
- B2.1 Pipe Threads (Except Dryseal)

- B15.1Safety Standard for Mechanical Power Transmission Apparatus
- B16.1Cast Iron Pipe Flanges and Flanged Fittings (Class 25, 125, 250, and 800)
- B16.3 Malleable Iron, Threaded Fittings (Class 150 and 300)
- B16.5 Steel Pipe Flanges and Flanged Fittings (Including Ratings for Class 150, 300, 400, 600, 900, 1500, and 2500)
- B16.9 Factory-Made Wrought Steel Buttwelding Fittings
- B16.11Forged Steel Fittings, Socket-Welding and Threaded
- B16.39 Malleable Iron, Threaded Pipe Unions (Class 150, 250 and 300)
- B18.2.1 Square and Hex Bolts and Screws (Including Hex Cap Screws and Lag Screws)
- B18.2.2 Square and Hex Nuts
- B31.1Power Piping, B31.1.0a-1971, B31.1.0b-1971, B31.1.0c-1972, B31.1.0d-1972
- C37.13 Low-Voltage AC Power Circuit Breakers Used in Enclosures
- C37.16 Preferred Ratings, Related Requirements, and Application Recommendations for Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors
- C37.17 Trip Devices for AC and General Purpose DC Low-Voltage Power Circuit Breakers
- C57.13 Requirements for Instrument Transformers
- Z55.1 Gray Finishes for Industrial Apparatus and Equipment

c. American Society of Mechanical Engineers (ASME) Publication:

- ASME Boiler and Pressure Vessel Code: Section VIII - Pressure Vessels

d. American Society for Testing and Materials (ASTM) Publications:

- A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- A126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- A181Forgings, Carbon Steel, for General-Purpose Piping
- A193 Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- A194 Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
- A234 Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- A307 Carbon Steel Externally Threaded Standard Fasteners
- B8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft
- B33Tinned Soft or Annealed Copper Wire for Electrical Purposes

- D178Rubber Insulating Matting

e. American Water Works Association (AWWA) Publication:

- C601Standard for Disinfecting Water Mains

f. Diesel Engine Manufacturers Association (DEMA) Publication:

- Standard Practices for Stationary Diesel and Gas Engines

g. Institute of Electrical and Electronic Engineers (IEEE) Publications:

- 32 Requirements, Terminology, and Test Procedure for Neutral Grounding Devices
- 115 Test Procedures for Synchronous Machines
- 126 Internal Combustion Engine-Generator Units, Recommended Specification for Speed Governing of
- 421 Standard Criteria and Definitions for Excitation Systems for Synchronous Machines

h. Insulated Cable Engineers Association (ICEA) Publications:

- S-19-81Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- S-61-402 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- S-66-524 Cross-Linked-Thermosetting-Polyethylene-
  Interim Insulated Wire and Cable for the
  Standard No. 1Transmission and Distribution of Electrical Energy
- S-68-516 Cables Rated 0-35,000 Volts and Having
  Interim Ozone-Resistant Ethylene-Propylene Rubber
  Standard No. 1Insulation

i. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publication:

- SP 83 Carbon Steel Pipe Unions, Socket-Welding and Threaded

j. National Electrical Manufacturers Association (NEMA) Publications:

- AB 1 Molded Case Circuit Breakers
- ICS 1 General Standards for Industrial Control and Systems
- LA 1 Surge Arresters
- MG 1 Motors and Generators
- PV 5 Constant-Potential-Type Electric Utility (Semiconductor Static Converter) Battery Chargers

- SG 3 Low-Voltage Power Circuit Breakers
- ST 20 Dry-Type Transformers for General Applications
- TR 27Commercial, Institutional and Industrial Dry-Type Transformers

k. National Fire Protection Association (NFPA) Standards:

- 30 Flammable and Combustible Liquids Code
- 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- 70 National Electric Code
- 110 Emergency and Standby Power Systems
- 325 Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids
- 495 Explosive Materials Code

l. Tubular Exchanger Manufacturer's Association (TEMA) Publication:

- Standards of Tubular Exchanger Manufacturer's Association

m. Underwriters Laboratories, Inc. (UL) Publications:

- UL 429 Electrically Operated Valves
- UL 2200 Stationary Engine Generator Assemblies
- UL 67 Panelboards

3. SUBMITTALS:

a. Shop Drawings: Submit for the following:

1. Engine Generator
2. Emergency Sub Panel

b. Engine Generator Submittal: Submittal shall contain as a minimum:

1. Drawings of generator unit showing dimensions and weights
2. Tabulated data on:

- Make of engine.
- Number of cylinders.
- Bore, liters (inches).
- Stroke, liters (inches).
- Piston displacement, liters (cubic inches).
- Piston speed, liters per minute (feet/min.), @ rated rpm.
- BMEP @ rated KW output.
- Make and type of generator.

- Generator electrical rating, KVA or KW @ 0.8 power factor.
- Number and type of bearings.
- Exciter type.
- Generator insulation class and temperature rise.
- Parts and service support.
- Engine manufacturer's certified engine BHP curve and certified gen-set fuel consumption.
- Cooling system.
- EPA certification.

3. installation drawings showing installation requirements
4. spare parts list, manufacturer's operation and maintenance manuals for engine generator and major accessories
5. training schedule for Owner's personnel instruction

c. Generator Sizing Calculations: Submit per the requirements of Article 2.2.1.8.

4. Operation and Maintenance Manual:

a. QUALITY ASSURANCE: In each standard referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears.

b. Operating Experience Requirements: Engines installed on site shall meet all of the operating experience requirements listed below.

1. Only stationary electric generation service is considered as equivalent experience. Engines driving pumps or compressors or in marine propulsion or railroad service are not acceptable.

2. Only experience on the same engine model is acceptable. Engine model is considered to be a given series or class of identical bore and stroke and of the same type of engine, such as in-line or vee. In-line and vee engines with identical bore and stroke are considered as two separate models of engines.

3. Only experience at the identical rotative speed as that which is offered is acceptable.

4. Only experience at the identical or higher brake mean effective pressure as that which is offered is acceptable.

5. Only experience with oil and dual fuel engines is acceptable.

c. Engine/Gen-Set Unit: Unit shall be capable of continuous full power service at rated output for duration of standby service. Engine/generator shall be product

of one manufacturer, and the manufacturer and its authorized dealer shall have sole responsibility for the performance of the propane engine/ generator set and its accessories. Propane engine/generator shall be completely shop assembled, tested and adjusted prior to shipment.

5. SERVICES:

a. The manufacturer shall furnish a qualified local field representative to inspect and/or adjust the equipment after installation, to supervise its initial operation and to train plant personnel in operation and maintenance of the equipment specified. Service organization shall be located within 24-hour travel time of the project.

b. After the emergency generator system is installed and proved operational, the manufacturer shall provide factory trained service technicians for a minimum of 8 hours of operation and maintenance training of the Owner's plant personnel of the generator system as installed.

6. WARRANTY:

After equipment is installed, operational, and accepted by Owner, the Contractor shall furnish a two-year warranty against defects in material and workmanship. Warranty coverage shall include all parts, labor and travel expenses.

PRODUCTS

PART 2

PART 2 - Products

1. MATERIALS AND EQUIPMENT:

Materials, equipment and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

a. Manufacturing: Onan, Caterpillar, Kohler, or approved equal.

2. ENGINE/GENERATOR SET:

a. Rating: The AC engine/generator set, shall be rated by the manufacturer for minimum standby operation at: 25 KW, 31 KVA at 0.8 pf, 60 Hz, 1800 rpm for use with 208 volt AC, 1 phase, 3-wire system.

1. The generator set manufacturer shall verify the propane engine as capable of driving the generator with all accessories in place and operating, at the generator set KW rating after de-rating for the range of temperatures expected in service and the altitude of the installation. Site conditions are: 104 degrees F (40 degrees C) maximum ambient, and 1400 feet ± altitude.

2. Voltage regulation shall be ± 0.5 percent of rated voltage for any constant load between no load and rated load, and frequency regulation shall be isochronous from steady state no load to steady state rated load.

3. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed ± 0.5 percent of rated for constant loads from no load to rated load, with constant ambient and operating temperature.

4. Random Frequency Variation: Speed variations for constant loads from no load to rated load shall not exceed ±0.25 percent of rated speed, with constant ambient and operating temperature.

5. Total Harmonic Distortion: The sum of AC voltage waveform harmonics, from no load to full linear load, shall not exceed 5 percent of rated voltage (L-N, L-L, L-L-L) and no single harmonic shall exceed 3 percent of rated voltage.

6. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.

7. The engine/generator set shall be capable of picking up 100% of nameplate KW and power factor, less applicable de-rating factors, in one step with the engine/generator set at operating temperature, in accordance with NFPA Standard 110, Paragraph 5-13.2.6.

8. Engine/Gen-Set Unit: Unit shall be capable of continuous full power service at rated output for duration of standby service. Engine/generator shall be

product of one manufacturer, and the manufacturer and its authorized dealer shall have sole responsibility for the performance of the engine/generator set and its accessories. Engine/generator shall be completely shop assembled, tested and adjusted prior to shipment.

a. Submit starting calculations for the generator based on the following:

- Maximum starting voltage dip – 20%
- Maximum peak voltage dip – 20%
- Maximum frequency dip – 10%
- Minimum load rated capacity – 30%

b. Motor starting KVA shall be based on the following required loads and the above referenced criteria:

Step 1:

- 7 kVA Misc. (Computer and Server Equipment)
- 4 kW Misc. (Air Conditioner)
- 7kVA Misc. (Computer and Server Equipment)

3. AC GENERATOR, REGULATOR AND EXCITER UNIT:

The AC generator exciter and voltage regulator shall be designed and manufactured by the engine/generator set manufacturer as a complete generator system. The generator shall meet all requirements of NEMA MG-1, Part 22, in design, performance and factory test procedures. The generator and regulator will be C.S.A. listed. The regulator shall be factory wired and tested with the generator. Cast iron end brackets and fabricated steel frames shall be used. The unit shall be fully guarded per NEMA MG-1-1.25. Bearings shall be pre-lubricated, shielded, ball-type with provisions for adding and/or changing grease through extended supply and relief tubes. Minimum B-10 bearing life shall be 40,000 hours for single bearing units.

a. The AC generator shall be synchronous, four pole, 12 lead (reconnectable), revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s). The armature shall have skewed laminations of insulated electrical grade steel, two-thirds pitch windings. The rotor shall have amortissuer (damper) windings, layer wound mechanically wedged winding construction. The rotor shall be dynamically balanced. The exciter shall be brushless, single phase, with full wave silicon diodes mounted on the rotating shaft and a surge suppressor connected in parallel with the field winding. Field discharge resistors shall not be acceptable. Systems using two-wire solid-state devices (such as SCRs or transistors) mounted on the rotor shaft shall not be acceptable.

b. AC output leads shall be brought out to field connection bus bars accessible through removable plates on either side of a sheet metal output box.

c. All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees Centigrade to provide additional allowance for internal hot spots. The main generator and exciter insulation systems must be suitably impregnated for operation in severe environments for resistance to sand, salt, and sea spray.

d. A permanent magnet generator (PMG) shall provide excitation power to the automatic voltage regulator for immunity from voltage distortion caused by nonlinear SCR controlled loads on the generator. The PMG shall sustain main field excitation power for optimum motor starting and to sustain short circuit current for selective operation and coordination of system over-current devices.

e. The automatic voltage regulator shall be temperature compensated solid-state design and include overvoltage and overexcitation protection functions. The voltage regulator shall be equipped with single phase RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. Overvoltage protection shall sense the AC generator output voltage and in the event of regulator failure or loss of reference, shut down regulator output on a sustained overvoltage of one (1) second duration. Overexcitation protection shall sense regulator output and shut down regulator output if overloads exceed ten (10) seconds duration. Both overvoltage and overexcitation protection shutdowns shall be latched, requiring the AC generator to be stopped for reset. The regulator shall include an under frequency roll-off torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 Hz (48-49 Hz on 50 Hz system). The torque-matching characteristic shall include differential rate of frequency change compensation to use maximum available engine torque and provide optimal transient load response. Regulators which use fixed volts per hertz characteristic are not acceptable.

4. GENERATOR SET CONTROL:

The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this Specification.

The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

The generator set mounted control shall include the following features and functions:

1. Control Switches:

    a. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or Manual position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
    b. EMERGENCY STOP switch. Switch shall be Red “mushroom-head” push-button. Depressing the emergency stop, switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
    c. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
    d. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

2. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions.

    a. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor.
    b. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
    c. The control system shall log total number of operating hours, total kWH, and total control on hours, as well as total values since reset.

3. Generator Set Alarm and Status Display:

    a. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:

b. The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for function, color and control action (status, warning, or shutdown).
c. The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
d. The control shall include a flashing red lamp to indicate that the control is not automatic state, and red common shutdown lamp.
e. The control shall include an amber common warning indication lamp.

4. The generator set control shall indicate the existence of the following alarm and shutdown conditions on an alphanumeric digital display panel:

   low oil level (alarm)
   low oil pressure (alarm)
   low oil pressure (shutdown)
   oil pressure sender failure (alarm)
   low coolant temperature (alarm)
   high coolant temperature (alarm)
   high coolant temperature (shutdown)
   high oil temperature (warning)
   engine temperature sender failure (alarm)
   low coolant level (alarm or shutdown-selectable)
   fail to crank (shutdown)
   fail to start/overcrank (shutdown)
   overspeed (shutdown)
   low DC voltage (alarm)
   high DC voltage (alarm)
   weak battery (alarm)
   low fuel-pressure (alarm)
   high AC voltage (shutdown)
   low AC voltage (shutdown)
   under frequency (shutdown)
   overcurrent (warning)
   overcurrent (shutdown)
   short circuit (shutdown) ground fault (alarm) (optional - when required by code or specified)
   overload (alarm)
   emergency stop (shutdown)

5. Provisions shall be made for indication alarm or shutdown conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not to automatically respond to a command to start from a remote location.

6. The control shutdown fault conditions shall be configurable for fault bypass.

5. Engine Status Monitoring:

a. The following information shall be available from a digital status panel on the generator set control:

- engine oil pressure (psi or kPA)
- engine coolant temperature (degrees F or C)
- engine oil temperature (degrees F or C)
- engine speed (rpm)
- number of hours of operation (hours)
- number of start attempts
- battery voltage (DC volts)

b. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

6. Engine Control Functions:

a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.

b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.

c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this Specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while unit is starting.

d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure condition.

7. Alternator Control Functions:

a. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from miss operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot.

   The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

b. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The control shall shutdown and lock out the generator set when output current level approaches the thermal damage point of the alternator (overcurrent shutdown). The protective functions provided shall be in compliance to the requirements of NFPA 70 Article 445.

c. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shutdown and lock out the generator set when output current level approaches the terminal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA 70 Article 445.

d. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (overload) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load-shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.

e. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage

exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

f. When required by the National Electrical Code, the control system shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds. The relay shall be for an indication only and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that will function correctly in system as installed.

g. If required by manufacturer, generator shall include a 120VAC-control heater for control panel. Contractor to provide branch circuit if required.

8. Other Control Functions:

a. A battery monitoring system shall be provided which indicates alarms when DC control and starting voltage is less than 25VDC or more than 32VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

9. PROPANE ENGINE:

The engine shall be designed specifically for generator set duty. The engine shall be 4 cycle, propane fueled, spark-ignited, IMPCO carburetion, 9.3:1 compression ration, with forged steel crankshaft and connecting rods. The cylinder block shall be cast iron. Two cycle engines are not acceptable.

a. An electric governor consisting of a magnetic pickup speed sensor, adjustable electronic control, and an electric actuator shall provide automatic engine/generator set frequency regulation adjustable from isochronous to 5 percent drop. Governors using external throttle linkages shall not be acceptable.

b. The engine shall be cooled by a unit mounted radiator, coolant pump and thermostat temperature control. The cooling system shall be rated for full rated load operation in 104 degrees F (40 degrees C) ambient conditions. The cooling capability of the generator set shall be demonstrated by prototype tests on a representative generator set model. These tests will be conducted by the generator set manufacturer; calculated data from the heat exchanger manufacturer only is not sufficient. The engine shall be equipped with an engine driven, centrifugal-type water circulating pump and thermostatic valve to maintain the engine at recommended temperature level. The engine portion of the cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact. Provide manually operated relief valves at all high points in coolant piping system.

c. The engine fuel system shall include secondary fuel propane regulation and air/propane valve.

d. Generator to be EPA certified.

10. ENGINE ACCESSORY EQUIPMENT:

The engine generator set shall include the additional engine accessories as follows:

a. A 12-volt DC electric starter capable of three complete cranking cycles without overheating, before over-crank shutdown (75 seconds).

b. Engine driven positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

c. Provide flexible propane fuel line to propane tank.

d. Engine mounted and driven 12-volt DC battery charging alternator, 35 ampere minimum, and solid-state voltage regulator.

e. Base: The engine/generator set shall be mounted on a heavy-duty steel base to maintain proper alignment between components. Provide manufacture recommended vibration isolators. The engine/generator set shall incorporate a corrosion resistant battery tray with battery hold-down clamps within the base rails. Provisions for stub up of electrical and fuel connections shall be within the footprint of the generator set base rails.

f. Oil drain and coolant drain lines shall be extended to outside of steel base for maintenance purposes. Provide shut-off isolation valves on coolant system supply and return to facilitate draining and flushing of coolant.

11. GENERATOR SET AUXILIARY EQUIPMENT:

a. Generator main circuit breaker, mounted and wired, UL listed, insulated case thermal-magnetic type. Circuit breaker shall be 100% rated at 100 amps.

b. Engine mounted, thermostatically controlled, coolant heater for the engine. The heater shall be rated single phase, 50/60 Hz, 120V. Provide control relay to de-energize heater when engine is running.

c. Exhaust muffler shall be provided, size and type as recommended by the generator set manufacturer. The muffler shall be critical silence grade. Flexible exhaust connection shall be provided for connection between the engine exhaust manifold and exhaust line. System shall be in compliance with applicable codes and standards. An exhaust system condensation trap

with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine shall be installed on the muffler.

d. Vibration isolators, quantity and type as recommended by the generator set manufacturer.

e. Starting and Control Batteries: Starting batteries 12 volt DC, sized as recommended by the generator set manufacturer, shall be supplied with battery cables and connectors.

f. Battery Charger: A 10 amp voltage regulated battery charger shall be provided for each engine/generator set. Charger shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual Form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:

- Loss of AC power - red light
- Low battery voltage - red light
- High battery voltage - red light
- Power On - green light (no relay contact)

12. OUTDOOR WEATHER-PROTECTIVE ENCLOSURE:

a. Generator set housing shall be provided factory-assembled to generator set base and radiator cowling. Housing shall be fully weatherproof, sound attenuated, and factory installed. Exhaust silencers shall be internal to enclosure. Sound level of generator system shall be less than or equal to 66 dBA at full load measured 23 feet from the generator. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating which meets the following requirements:

- Primer thickness, 0.5-2.0 mils.
- Top coat thickness, 0.8-1.2 mils.
- Gloss, per ASTM D523-89, 80% plus or minus 5%.
- Gloss retention after one year shall exceed 50%.
- Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
- Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
- Salt Spray, per ASTM B117-90, 1000+ hours.
- Humidity, per ASTM D2247-92, 1000+ hours.
- Water Soak, per ASTM D2247-92, 1000+hours.

b. Painting of hoses, clamps, wiring harness, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant and designed to minimize marring of the painted surface when removed for normal installation or service work.

13. EMERGENCY SUB PANEL:

a. PANELBOARD: UL 67 and UL 50. Panelboard for use as service disconnecting means shall additionally conform to UL 869. Panelboard shall be circuit breaker equipped. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. Panelboard locks shall be keyed same. Directories shall be typed to indicate load served by each circuit and mounted in holder behind transparent protective covering. Panelboard shall be provided with integral TVSS per manufacturers recommendations.

b. Panelboard Buses: Provide copper bus bar. Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet. In addition to equipment grounding bus, provide second "isolated" ground bus, where indicated.

c. Panelboard Ratings shall be as follows:
    1. Electrical Characteristics - 120/208V, 1-phase, 3-wire
    2. Main Bus – 100A
    3. Main Breaker – 100A
    4. Total 1P spaces – 24
    5. Minimum Interrupting Rating – 10KAIC
    6. Enclosure – NEMA 1, 20” Wide Door-in-Door Trim
    7. Provide with one (1) 35A/2P branch circuit breaker
    8. Provide with three (3) 20A/2P branch circuit breakers
    9. Provide with eight (8) 20A/1P branch circuit breakers

14. Feeder and Branch Circuits:

a. Provide Three (3) 100A Feeder Circuits: One from Owner’s designated panelboard to ATS normal terminals, one from generator to ATS emergency terminals and one from ATS to emergency sub panel. All 100A feeder circuits shall consist of 3#2 & 1#8 Gnd. 1-1/2”c. Provide a 100A, 2-pole 240V rated circuit breaker in Owner’s designated panelboard. Circuit breaker shall be same make, model and KAIC rating as existing panelboard. Report any discrepancies to Owner.

b. HVAC Branch Circuit: Provide one (1) branch circuit to HVAC outdoor unit as follows: Branch circuit to consist of 2#8 & 1#10 Gnd. ¾"c. Provide NEMA 3R lockable fused disconnect at outdoor condensing unit. Provide individual branch circuit breaker in emergency sub panel. Provide a 120V, 20A, weatherproof GFI receptacle at minimum of 36" above finished grade at outdoor condensing unit. Provide (2#12 & 1#12 Gnd. ¾"c) branch circuit to emergency sub panel. Provide NEMA 1 lockable non-fused disconnect adjacent to indoor HVAC unit.

c. Generator Support Equipment Branch Circuits: Provide minimum of two (2) 120V, 20A branch circuits for generator block heater and battery charger. If required of generator manufacturer, provide 120V, 20A branch circuit for control panel heater. Branch circuits to consist of (2#12 & 1#12 Gnd. ¾"c). Provide individual branch circuit breakers in emergency sub panel.

d. Provide generator start control circuit consisting of 6#14 & (1)STP#16, 1-1/2"c from ATS to generator control panel.

15. Conduit Schedule:

Provide EMT for all indoor conduits. Provide RGS for all exterior conduits. Provide liquid-tite flexible conduits (4' max) for all conduit connections at generator and HVAC equipment.

16. Concrete Generator Pad:

Provide concrete generator pad consisting of 3000 psi concrete and 6x6 welded wire mesh reinforcing. Pad to be a minimum of 12" thick and shall extend beyond the support structure of the generator a minimum of 6" in all directions. Install pad so top of pad is at 4" above finished grade. Install pad on minimum of 12" compacted crushed stone.

17. Generator Ground Ring:

Provide generator ground ring consisting of #1/0 bare cu buried minimum of 30" below finished ground. Ground ring shall be installed completely around generator pad. Exothermically connect ring to two (2) ¾" x 10' cu ground rods at diagonally opposite corners. Provide two (2) #1/0 bare cu whips to connect ground ring to generator.

18. Propane Fuel Storage System:

Contractor to provide necessary propane fuel piping and regulators as necessary to the Owner furnished propane storage system. Coordinate final propane fuel system requirements with owner.

EXECUTION

PART 3

PART 3- Execution

1. INSTALLATION:

Installation shall conform to the requirements of NFPA 70 and manufacturer's recommendations.

Contractor shall install vibration isolators on the concrete pad and shall mount the new propane generator on them. The contractor will coordinate location of generator system and shall install per NEC and generator manufacturers installation instructions in regards to NEC clearances, maintenance clearances, air intake requirements and engine exhaust requirements. Contractor to notify Owner if location is not suitable for installation in regards to any clearance or exhaust system discharge issues.

2. START-UP:

Provide the services of competent technicians regularly employed by the supplier or manufacturer of the propane emergency generator system to ensure proper operation of the system during start-up. Services shall include calibration of field devices, adjustments to controlled systems and any other services required to prepare the system for field testing and normal operation.

a. Adjustments: Adjust controls and equipment to maintain the conditions indicated, to perform the functions indicated and to operate in the sequence specified.

3. TESTING:

a. Factory Testing:

1. The generator set manufacturer shall perform a complete operation test on the generator set prior to shipping from the factory. A certified test report shall be provided. equipment supplied shall be fully tested at the factory for function and performance.

2. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

b. On Site Acceptance Test:

1. The complete installation shall be tested for compliance with the Specification following completion of all site work. All commissioning,

start-up, testing, and training of Owner's Personnel shall be conducted by representatives of the manufacturer. The electrical contract must provide Owner and Project Engineer with a minimum of 72 hours workday written notice as to the date and time the test is scheduled.

2. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pick up test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test.

3. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the main service disconnect, and observing proper operation of the system for at least 3 hours. Coordinate timing and obtain approval for start of test with site personnel.

4. Test and certify generator alarm conditions are satisfactorily indicated.

5. Contractor to log fuel used for start-up, testing, acceptance and training of generator system. Upon completion, Contractor to have tanks refilled with amount of fuel used.

6. The Contractor shall submit three copies of the operation and maintenance manual and three copies of the test plan to the Owner not less than 14 days prior to acceptance testing. Test plan, shall as a minimum, indicate how the system is to be tested, what variables will be monitored during the test and what criteria for acceptance should be used.

4. INSTRUCTING OPERATING PERSONNEL:

Upon completion of the work, and after successful acceptance testing, provide instruction to the Owner in the proper operation and maintenance of each device, or indicated system. The period of instruction shall be for not less than one (1) 6-hour session and shall be in addition to start-up service time. Prior to any instruction sessions, the Contractor shall submit a written proposed outline of material to be covered with a proposed time schedule. The outline and schedule shall be subject to review and approval by the Owner who shall have the right to modify said outline and schedule. Contractor shall furnish outline and schedule a minimum of 3 weeks prior to proposed starting date of any training.

Air Conditioner Systems

PART 1

PART 1 DESCRIPTION: GENERAL

Under this Section, the Contractor shall furnish all labor, materials and equipment for Unitary Air Conditioning Systems, as specified, and/or directed.

2. REFERENCES:

The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

a. American National Standards Institute, Inc. (ANSI) Publications:

- B16.22 Wrought Copper and Bronze Solder-Joint Pressure Fittings
- B31.5 Refrigerant Piping

b. Air-Conditioning and Refrigeration Institute (ARI) Publications:
- 210 Unitary Air Conditioning Equipment
- 260 Application, Installation and Servicing of Unitary Systems
- 360 Commercial and Industrial Unitary Air Conditioning Equipment
- DCAACP Directory of Certified Applied Air Conditioning Products

c. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) Publications:
- 15 Safety Code for Mechanical Refrigeration
- 52 Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter
- SHPD Handbook and Product Directory Systems

d. American Society for Testing and Materials (ASTM) Publications:
- A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- A120 Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
- A386 Zinc Coating (Hot-Dip) on Assembled Steel Products
- B88 Seamless Copper Water Tube
- B117 Salt Spray (Fog) Testing
- B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- C534 Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- D1654 Painted or Coated Specimens Subjected to Corrosive Environments
- E84 Test for Surface Burning Characteristics of Building Materials

e. American Welding Society, Inc. (AWS) Publication:
- A5.8Brazing Filler Material

f. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publications:
- SP 58Pipe Hangers and Supports - Materials and Design

g. National Electrical Manufacturers Association (NEMA) Publications:
- MG1 Motors and Generators
- ICS1 Industrial Control and Systems
- ICS2 Industrial Controls Devices, Controllers and Assemblies
- ICS6 Enclosures For Industrial Controls and Systems

h. Underwriters Laboratories, Inc. (UL) Publications:
- 109 Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service and Marine Use
- 873 Temperature Indicating and Regulating Equipment

i. Uniform Fire Prevention and Building Code of New York State:
- 2010 Mechanical Code of New York State
- 2010 Energy Conservation Construction Code of New York State

3. GENERAL REQUIREMENTS:

"Mechanical General Requirements", with the following additions and modifications, applies.

4. SUBMITTALS:

a. Manufacturer's Catalog Data:
Manufacturer's Data:

1. Split Air Handling Units
2. Air-Cooled Condensing Units
3. Filters
4. Refrigerant Piping and Accessories

b. Test Reports:
Certified Test Reports:

1. Corrosion Protection

c. Operation and Maintenance Manuals:
1. Split Air Handling Units
2. Air-Cooled Condensing Units

5. PIPING DEFINITION:

Piping, as used in this Specification, includes pipe, tubes, flanges, bolting, gaskets, valves, and fittings; the pressure containing parts of other components such as strainers, sight gages, and dehydrators; and pipe supporting fixtures and structural attachments.

6. SAFETY STANDARD:

Design, manufacture, and installation of mechanical refrigeration equipment shall conform to ASHRAE 15.

7. CORROSION PREVENTION:

Special protection is not required for equipment that has a zinc coating conforming to ASTM A386 or a duplex coating of zinc and paint. Where expressly stipulated in equipment requirements paragraphs below, the affected equipment items shall be protected by the manufacturer with a corrosion-inhibiting coating or paint system that has been proved capable of satisfactorily withstanding the following test. Test method shall be ASTM B117. Period of test shall be 125 hours for equipment intended for installation indoors; test period shall be 500 hours for equipment which will be installed outdoors or which will be otherwise subjected to marine atmosphere. Each specimen shall have a standard scratch as defined in ASTM D1654.

a. Corrosion Criteria: Upon completion of exposure, coating or paint shall show no indication of deterioration or loss of adhesion, nor shall there be indication of rust or corrosion extending further than 1/8 inch on either side of original scratch.

b. Thickness of Coating: Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry film thickness.

8. MOTORS:

NEMA MG1. Motor starters shall conform to NEMA ICS1 and NEMA ICS2. Determine specific motor characteristics to insure provision of correctly sized starters and overload heaters. Motors shall be designed to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating. Motor size shall be sufficient for the duty to be performed and shall not exceed its full load nameplate current rating when driven equipment is operated at specified capacity under the most severe conditions likely to be encountered. When motor size provided differs from the size indicated or specified, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, and branch circuit protection to accommodate the equipment actually provided.

PRODUCTS

PART 2

PART 2 - Products

1. SPLIT-SYSTEM AIR CONDITIONERS:

The separate assemblies shall be designed to be used together, and ratings shall be based on the use of the matched assemblies. Provide performance diagrams for units with capacities not certified by ARI to demonstrate that the components of the air conditioning system furnished will satisfy the capacity requirement specified or indicated on the drawings. Units shall have a minimum SEER of 15 when tested in accordance with ARI 210 or ARI 360, as applicable, utilizing R410A refrigerant. Submit data to demonstrate that the units will produce the performance factors specified. Manufacture shall be as by Panasonic Model 36PST1U6, or equal, with a Model S-36PT1U6 indoor ceiling suspended unit and a Model C-36PS1U6 outdoor unit. The system capacity, electrical characteristics and operating conditions shall be as follows:

AIRFLOW (CFM – HI/MED/LOW)	COOLING CAPACITY (BTU/H)	POWER SUPPLY (V/PH/HZ)	RUNNING AMPS	REFRIG. PIPE SIZE (SUCTION/LIQUID)
1,100/930/750	31,200	208/1/60	20.1	5/8” / 3/8”

a. Single Zone Units: Units shall be single zone type arranged to draw through the coil sections. Indoor unit shall be a ceiling suspended unit with automatically operating discharge louvers.

b. Direct Expansion (DX) Cooling Coils: DX coils aluminum fins, seamless copper tubes, suitable for use with R410A refrigerant. Cooling coils shall have bottom drainage connections on suction headers.

c. Compressors: Compressors shall be inverter driven variable speed rotary type and shall have a device to prevent short cycling when shutdown by safety controls. Motor starter and disconnect enclosure shall be weather resistant and watertight type in accordance with NEMA ICS6.

    - Condenser Controls: System providing heat pressure control to insure condensing temperatures for capacity rated system operation to all ambient temperatures down to 0ºF.

d. Fans, Condenser and Evaporator: Evaporator fan shall be direct drive type with three speed motor and automatic controls/Motors shall be open type. Starter enclosure and disconnect shall be general purpose for indoor units and weather resistant watertight type for outdoor condensing units in accordance with NEMA ICS6.

e. Corrosion Protection: Outdoor units shall be factory-corrosion protected in accordance with the paragraph herein entitled, "Corrosion Prevention".

f. System Controls: Microprocessor based unit-mounted with large graphic wired remote control display for temperature and humidity control, unit alarms, event log, auto restart, system view, 24-hour clock, weekly timer, dry mode, air sweep and louver control, active alarms on status screen, and control keys for user inputs.

g. FILTERS: Provide filters to return air and locate inside filter frame. Filters shall be washable type, and shall conform to UL 900. Polyurethane filters shall not be used on units with multi-frame filters.

2. PIPING SYSTEMS INSULATION:

Piping systems requiring insulation, types of insulation required, and insulation thickness shall meet the requirements of the Energy Conservation Construction Code of New York State and the equipment manufacturer's requirements. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Use factory premolded, precut or field-fabricated insulation of the same thickness and conductivity as used on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling.

a. Flexible Unicellular Insulation: ASTM C534. Provide 1-1/2 inch thick flexible unicellular insulation on all suction and liquid refrigerant piping, both inside the building and outside the building. For all unicellular insulation located outside, provide two coats of vinyl lacquer finish or equivalent according to manufacturer's recommendations.

3. REFRIGERANT PIPING AND ACCESSORIES:

Provide accessories as specified herein. A filter-drier shall be provided in the liquid line.

a. Factory Charged Tubing: Tubing shall be extra soft, deoxidized, bright annealed copper conforming to ASTM B280, factory dehydrated and furnished with a balanced charge of refrigerant recommended by the manufacturer of equipment being connected. The suction line tubing shall be factory insulated with 3/8 inch minimum thickness of closed cell, foamed plastic conforming to ASTM C534 with a permeance rating not to exceed 1.0. The tubing shall contain quick-connectors with caps or plugs to protect couplings. Include couplings for suction and liquid line connections of the indoor and outdoor sections.

b. Field Assembled Piping: Material and dimensional requirements for field-assembled refrigerant piping, valves, fittings, and accessories shall conform to ASHRAE 15 and ANSI B31.5, except as herein specified. Refrigerant piping shall be cleaned, dehydrated, and sealed when delivered. Refrigerant piping shall be seamless copper tubing, hard drawn, Type K or L, conforming to ASTM B88, except that tubing with outside diameters of 1/4 inch and 3/8 inch shall have nominal wall thickness of not less than 0.30 inches and 0.032 inches, respectively. Soft annealed copper tubing conforming to ASTM B280 may be used where flare connections to equipment are required only in nominal sizes less than 1 inch.

c. Fittings: ANSI B16.22 for solder-joint fittings. UL 109 for flared tube fittings.

d. Brazing Filler Material: AWS A5.8.

e. Pipe Hangers and Supports: MSS SP 69 and MSS SP 58.

f. Pipe Sleeves: Provide sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 0.25-inch space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation and calk at both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

    1. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide ASTM A53 or ASTM A120, Schedule 40 or Standard Weight, zinc-coated steel pipe sleeves. Core-drill penetrations in existing walls and grout sleeves in place with non-shrink grout.

    2. Sleeves in Partitions and Non-Masonry Structures: Sleeves in Partitions and Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide zinc-coated steel sheet having a nominal weight of not less than 0.90 pounds per square foot.

4. CONCRETE EQUIPMENT PADS:

Provide concrete pads consisting of 3000 psi concrete and 6x6 welded wire mesh reinforcing. Pads to be a minimum of 6” thick and shall extend beyond the base structure of the equipment unit a minimum of 6” in all directions. Install pads so top of pads are 4” above finished grade. Install pads on minimum of 12” compacted crushed stone.

EXECUTION
PART 3

PART 3 - Execution

1. INSTALLATION:

ARI 260, and as specified herein.

a. General: Install equipment and components in a manner to insure proper and sequential operation of the equipment and equipment controls. Installation of equipment not covered herein or in manufacturer's instructions shall be installed as recommended by manufacturer's representative. All installations shall comply with the applicable NYS codes and regulations. Provide proper foundations for mounting of equipment, accessories, appurtenances, piping and controls including, but not limited to, supports, vibration isolators, stands, guides, anchors, clamps and brackets. Foundations for equipment shall conform to equipment manufacturer's recommendation, unless otherwise indicated on drawings. Set anchor bolts and sleeves accurately using properly constructed templates. Anchor bolts shall be of adequate length and provided with welded-on plates on the head end embedded in the concrete. Level equipment bases, using jacks or steel wedges, and neatly grout-in with a nonshrinking type of grouting mortar. Locate equipment to allow working space for all necessary servicing such as shaft removal, disassembling compressor cylinders and pistons, replacing or adjusting drives, motors, or shaft seals, access to water heads and valves of shell and tube equipment, tube cleaning or replacement, access to automatic controls, refrigerant charging, lubrication, oil draining and working clearance under overhead lines. Provide electric isolation between dissimilar metals for the purpose of minimizing galvanic corrosion.

b. Unitary Air Conditioning System: Install system as indicated, in accordance with the requirements of ASHRAE 15, the manufacturer's installation and operational instructions, and applicable codes and regulations. Provide adequate clearances around outdoor unit for proper operation and airflow requirements.

c. Electrical Work: Electric motor-driven equipment specified herein shall be provided complete with motors, motor starters, and controls. Provide manual or automatic control and protective devices required for the operation herein specified and any control wiring required for controls and devices but not indicated.

d. Piping: Brazing, bending, forming and assembly of refrigerant piping shall conform to ANSI B31.5.

    1. Pipe Hangers and Supports: Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP 58. Hanger types and supports for bare and covered pipes shall conform to MSS SP 69

for the system temperature range. Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MSS SP58.

2. Pipe Insulation: Bonnet cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees and valve insulation. Where pipes penetrate fire walls, provide mineral fiber insulation inserts and sheet-metal sleeves. Insulate flanges, unions, valves and fittings in accordance with manufacturer's published instructions. Apply two coats of vinyl lacquer finish to flexible unicellular insulation in outside locations only.

3. Refrigerant Piping: Cut pipe accurately to measurements established at the site and work into place without springing or forcing. Install piping with sufficient flexibility to adequately provide for expansion and contraction due to temperature fluctuation. Where pipe passes through building structure, pipe joints shall not be concealed but located where they may be readily inspected. Run all pipe to be insulated as indicated and as required with sufficient clearance to permit application of insulation. Run all piping essentially as indicated and detailed on the plans; to avoid interference with other piping, conduit, or equipment. Except where specifically indicated otherwise, run piping plumb and straight and parallel to walls and ceilings. Trapping of lines shall not be permitted except where indicated. Provide sleeves of suitable size for all lines passing through building structure. Braze refrigerant piping with silver solder complying with AWS A5.8. The inside of tubing and fittings shall be free of flux. Clean the parts to be jointed with emery cloth and keep hot until the solder has penetrated the full depth of the fitting and the extra flux has been expelled. Cool joints in air and remove flame marks and traces of flux. During the brazing operation, prevent an oxide film from forming on the inside of the tubing by slowly flowing dry nitrogen through the tubing to expel the air. Make provisions to automatically return oil on halocarbon systems. Installation of piping shall comply with ANSI B31.5.

4. Returning Oil From Refrigerant System: Install refrigerant lines so that the gas velocity in the evaporator suction line is sufficient to move the oil along with the gas to the compressor. Where equipment location requires vertical risers, the line shall be sized to maintain sufficient velocity to lift the oil at minimum system loading and corresponding reduction of gas volume. Install a double riser when excess velocity and pressure drop would result from full system loading. The larger riser shall have a trap, of minimum volume, obtained by use of 90 degree and 45 degree ells. Arrange the small riser with inlet close to bottom of horizontal line, and connect to top of upper horizontal line. Do not install valves in risers.

5. Refrigerant Driers, Sight Glass Indicators, and Strainers: Provide refrigerant driers, sight glass liquid indicators, and strainers in refrigerant piping when not furnished by the manufacturer as part of the equipment. Install driers in liquid

line with service valves and valved bypass line the same size as liquid line in which the dryer is installed. Size of driers shall be determined by the piping and installation of the unit on location. Install dryers of 50 cubic inches and larger vertically with the cover for removing cartridge at the bottom. Moisture indicators shall be installed in the liquid line downstream of the drier. Indicator connections shall be the same size as the liquid line in which it is installed.

6. Strainer Locations and Installation: Locate strainers close to equipment they are to protect. Provide a strainer in the common refrigerant liquid supply to two or more thermal valves in parallel when each thermal valve has a built-in strainer. Install strainers with screen down and in direction of flow as indicated on strainer's body.

7. Solenoid Valve Installation: Solenoid valves shall be installed in horizontal lines with stem vertical and with flow in direction indicated on the valve. If not incorporated as integral part of the valve, provide a strainer upstream of the solenoid valve. Provide service valves upstream of the solenoid valve, upstream of the strainer, and downstream of the solenoid valve. Remove the internal parts of the solenoid valve when brazing the valve.

a. Auxiliary Drain Pans, Drain Connections, and Drain Lines: Provide auxiliary drain pans under all drain pans of units located above finished ceilings or over mechanical or electrical equipment where condensate overflow over unit drain pan may cause damage to ceilings, piping, and equipment below. Provide drain lines for all drain and auxiliary drain pans. Trap the drain from bottom pan of air conditioning units to insure complete pan drainage. Drain lines shall be full size of drain opening. Traps and piping shall be installed to designated drainage points. Where necessary, provide small unitary pumping units to pump condensate to designated drains.

b. Air Filters: Install air filters to allow access space for servicing the filters. Install filters with suitable sealing to prevent bypassing of air.

2. FIELD TESTS:

a. Tests: All tests shall be performed by and everything required for test shall be furnished by the Contractor, including personnel. Equipment and materials certified as having been successfully tested by the manufacturer in accordance with referenced specifications and standards will not require retesting before installation. Equipment and materials not tested at the place of manufacture shall be tested before or after installation, as applicable, where necessary to determine compliance with referenced specifications and standards.

1. Leak Testing: Upon completion of installation of the air conditioning equipment, test all factory- and field-installed refrigerant piping with an electronic-type leak detector to acquire a leak-tight refrigerant system. If leaks are detected at time of installation or during the guarantee period, remove the entire refrigerant charge from the system, correct the leaks, and retest the system.

2. Evacuation, Dehydration, and Charging: After refrigerant system is found to be without leaks or after leaks have been repaired on field-charged and factory-charged systems, evacuate the system using a reliable gage and a vacuum pump capable of pulling a vacuum of at least 1 mm Hg absolute. Evacuate system in accordance with the triple-evacuation and blotter method or, in accordance with equipment manufacturer's printed instructions. Charge the system with the appropriate refrigerant in the required quantity for proper system operation. System leak testing, evacuation, dehydration, and charging with refrigerant shall comply with the requirements contained in ARI 260.

3. Startup and Operation Tests: Test the air conditioning systems and systems components for proper operation. Adjust safety and automatic control instruments as necessary to insure proper operation and sequence. The operational test shall be not less than 8 hours.

4. Performance Tests: Upon completion of evacuation, charging, startup, final leak testing, and proper adjustment of controls, systems shall be performance tested to demonstrate compliance with performance and capacity requirements. Test systems for not less than 8 hours, during which time hourly readings shall be recorded. At the end of the test period, the readings shall be averaged and the average shall be considered to be the system performance.

5. Training: Provide a minimum four hours of instruction on operation and maintenance of system controls and equipment to Owner and/or Owner’s personnel.

3. IDENTIFICATION TAGS AND PLATES:

Provide equipment, gages, thermometers, valves, and controllers with tags numbered and stamped for their use. Plates and tags shall be of brass or suitable nonferrous material, securely mounted or attached. Minimum letter and numeral size shall be 1/8 inch high.

Automatic Transfer Switch

PART 1

PART 1: DESCRIPTION: GENERAL

1. Under this Section, the Contractor shall furnish all labor, materials and equipment for Automatic Transfer Switches as specified, and/or directed.

2. REFERENCES:

The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

a. Federal Standard (Fed. Std.):

- 595AColors & Change Notices1 thru 6

b. Institute of Electrical and Electronics Engineers (IEEE) Standard:

- 472 Guide for Surge Withstand Capability (SWC) Tests

c. National Electrical Manufacturers Association (NEMA) Standards:

- ICS 1 General Standards for Industrial Control and Systems
- ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies
- ICS 4 Terminal Blocks for Industrial Control Equipment and Systems
- ICS 6 Enclosures for Industrial Controls and Systems

d. National Fire Protection Association (NFPA) Publication:

- 70 National Electrical Code

e. Underwriters Laboratories, Inc. (UL) Publication:

- 1008 Automatic Transfer Switches

3. SUBMITTALS, FOR GENERAL USE AUTOMATIC TRANSFER SWITCH (ATS):

a. Shop Drawings: Submit for ATS. Include certified outline, electrical ratings, general arrangement, and detail drawings.

b. Certificates of Conformance: Submit for ATS as proof of compliance with UL and NEMA standards as specified. Certificates are not required if manufacturer's

published data submitted and approved reflect a UL listing and conformance with applicable publications of NEMA.

c. Certified Test Reports: Submit for each rating of ATS the reports of tests required by UL 1008 and by the additional requirements listed below. The proof of listing by UL shall be submitted and will be acceptable evidence that the ATS conforms to UL requirements.

1. Withstand and Closing Tests Above UL-1008: The ATS shall be rated for use on a circuit having an available short circuit current of 35,000 amperes RMS symmetrical at 20 percent power factor for a duration of 3 cycles when coordinated with molded case circuit breakers, 10 cycles when coordinated with power circuit breakers, and 0.5 cycle when coordinated with current limiting fuses. The withstand and closing tests shall be conducted at full rated system voltage in accordance with UL-1008. The 3- and 10-cycle tests shall be conducted without contact damage.

2. Dielectric Withstand Test: The dielectric withstand test shall be repeated in accordance with UL-1008, after the withstand test specified in paragraph titled "Withstand and Closing Tests Above UL-1008".

3. Non-Welding of Contacts: Automatic transfer switches shall be rated for non-welding of contacts when used with the feeder overcurrent devices indicated on the drawings and with the available fault current specified herein.

4. Operations and Maintenance Manual: Submit for ATS.

a. SUBMITTALS, FOR AUTOMATIC TRANSFER SWITCH (ATS):

1. Shop Drawings: Submit for ATS. Include a one-line diagram of the ATS assembly, an elementary or schematic diagram, a wiring diagram of the unit, and an interface equipment connection diagram that shall show all conduit and wiring between ATS and other related equipment. Device and nameplate numbers and item numbers shown on the list of equipment and materials shall appear on drawings wherever the item of equipment or material appears. The one-line diagram shall show interlocking provisions and cautionary notes, if any. Unless otherwise approved, the one-line and elementary or schematic diagram shall appear on the same drawing.

2. Manufacturer's Data: Submit a list of equipment and materials proposed, containing a description of each separate item of equipment or materials recommended for approval. The quantity of each item shall be indicated.

3. Certificates of Conformance: Submit for ATS as proof of compliance with UL and NEMA standards as specified. Certificates are not required if

manufacturer's published data submitted and approved reflect a UL listing and conformance with applicable publications of NEMA.

4. Operations and Maintenance Manual: Submit for ATS (2 copies).

5. SERVICE CONDITIONS:

ATS shall be continuously rated and suitable for performance under the following service conditions:

a. Altitude: ± 1,000 feet above mean sea level.

b. Temperature: Minus 10 degrees F. to 104 degrees F.

c. Relative Humidity: 95% (non-condensing).

6. SERVICES:

a. Manufacturer shall provide minimum 2 hours of Owner training to inspect and/or adjust the equipment after installation.

b. After the equipment is installed and operational, the Contractor shall furnish a two-year warranty against defects in material and workmanship.

PRODUCTS

PART 2

Part 2: Products

1. **GENERAL USE AUTOMATIC TRANSFER SWITCH (ATS):**

Provide automatic transfer switch rated as follows:

a. Voltage - 120/208V
b. Pole - 2-Pole Single Phase
c. Amperage - 200A
d. Neutral - Solid
e. Withstand Closing Rating - 35KAIC
f. NEMA Enclosure - 1

Transfer switch shall conform to UL 1008 as a recognized component for emergency systems, rated for all classes of loads when installed in an unventilated enclosure. Electrical operation shall be accomplished by a non-fused momentarily energized solenoid direct operating or electric motor operated mechanism or stored energy operator. Mechanical locking in each direction shall be provided. Operation shall be double throw switching where normal and emergency contacts operate. A midpoint pause to allow time for contactor dropout of large motor loads. ATS shall include quick-make, quick-break contact mechanisms for manual transfer under load.

a. ATS shall be microprocessor controlled including the following specifications: real-time display of ATS status, synchronous logic for disturbance free transfer, voltage unbalance, test modes, daylight-savings adjustment, optoisolated inputs, voltage and frequency sensing.

b. Caterpillar, Onan, Kohler, Zenith, ASCO, or equal.

c. Accessories: A separately mounted control unit shall include:

    1. Adjustable, 0 to 7-second time delay to override momentary dips in normal power source.

    2. Phase voltage relay supervision of three phases of the normal source. Relay shall dropout at 65 to 70 percent and pickup at 92 to 95 percent of nominal voltage to detect "brown-out" conditions.

    3. Voltage/frequency lockout relay with 90 percent pick-up nominal, to prevent premature transfer.

    4. System test switch, momentary type.

    5. Engine starting control contacts, one normally closed and one normally open.

    6. Auxiliary pilot contacts rated 10 amperes at 208 volts a.c., minimum of two

closed on normal and two closed on emergency.

7. Retransfer time delay to normal power source: adjustable from 0 to 30 minutes.

8. Adjustable time delay, 0 to 10 minutes, on shutdown of engine-generator after retransfer of the load to "normal".

9. Pilot lights to indicate source to which the load is connected.

10. Exerciser Clock: Provide solid-state exerciser clock to set the day, time and duration of generator set exercise/test period.

2. ENCLOSURE:

The switch and accessories shall be in a wall-mounted, and ventilated NEMA ICS 6, Type 1, smooth sheet metal enclosure constructed in accordance with UL 1008. Intake vent shall be screened and filtered. Exhaust vents shall be screened. Metal shall be not less than U.S. Standard Gauge No. 14. Doors shall have hinges, locking handle latch, and gaskets at jamb, sill, and head. The enclosure shall be equipped with one grounding lug grounding the enclosure using No. 6 AWG copper conductors. A thermostatically controlled heater shall also be provided within the enclosure to prevent condensation over the temperature range stipulated in paragraph titled "SERVICE CONDITIONS". The Contractor's field wiring terminating within the enclosure shall comply with NFPA 70. If wiring is not color coded, wires shall be permanently tagged near the terminal at each end with the wire number shown on approved shop drawings. Terminal blocks shall conform to NEMA ICS 4. Terminal facilities shall be arranged for entrance of external conductors from the top of the enclosure. Main switch terminals, including the neutral terminal, shall be of the pressure type and suitable for the termination of copper conductors shown.

a. Construction: The enclosure shall be constructed for convenient removal and replacement of contacts, coils, springs and control devices from the front without the removal of main power conductors or removal of major components.

b. Cleaning and Painting: Ferrous surfaces shall be cleaned and painted. Surfaces to be painted shall be free of all oil, grease, welding slag and spatter, mill scale, deleterious corrosion, dirt, and other foreign substances. Painting shall include at least one coat of rust-inhibiting primer and one coat of finish enamel. The rust-inhibiting primer shall be applied to a clean, dry surface as soon as practicable after cleaning. Painting shall be manufacturer's standard material and process, except the total dry film thickness shall be not less than 2.5 mils. Color of the finish coat may be the manufacturer's standard color, if approved, or No. 26314 Gray as specified in Fed. Std. 595. The finish shall be free from runs, sags, peeling or other defects.

EXECUTION

PART 3

Part 3: Execution

1. INSTALLATION:

Installation shall conform to the requirements of NFPA 70 and manufacturer's recommendations. Install in location as designated by Owner.

2. FIELD TESTS AND INSPECTIONS:

The Contractor shall furnish labor, equipment, and incidentals for, and shall perform all field tests. The Contractor shall give the Engineer 7 calendar days notice of the times scheduled for tests so that the Engineer may be present. Work affected by deficiencies shall be completely retested at the Contractor's expense. The manufacturer's factory representative shall assist the Contractor with the field test and inspection. Field tests shall include the following:

a. Simulate 3 power failures in duration of 15 minutes each and demonstrate complete ATS operation. Contractor shall show by demonstration in service that the ATS are in good operating condition, and function not less than five times.

b. Conduct 3-hour system load run utilizing Contractor-furnished portable load banks with each power source as follows:

   (1) 50% load: 30 minutes
   (2) 75% load: 30 minutes
   (3) Full load: Two hours

c. After 100% load bank tests are complete, Contractor shall perform complete system check in coordination with control equipment. Test(s) shall verify generator will operate and run as required for worst case system load.