ADDENDUM NO. 1 - Issued 03-06-2025
to the Project Manual and Drawings for

MAINTENANCE SHOP ADDITION
CRAIGHEAD ELECTRIC COOPERATIVE
JONESBORO, ARKANSAS
WDD JOB NO. 24-096

WITTENBERG, DELONY & DAVIDSON, INC.
5050 NORTHSHORE LANE
NORTH LITTLE ROCK, ARKANSAS 72118
(501)376-6681

This addendum forms a part of the contract documents and modifies or interprets the Project Manual and/or Drawings as noted herein.

GENERAL INFORMATION:

1. Summary of Changes Narrative dated 03-06-2025 is attached to this addendum and is made a part of the Bid Documents.

REFER TO THE PROJECT MANUAL:

Section 00 11 16:

1. CHANGE the Bid date to Friday, March 14, 2025 in lieu of Tuesday, March 11, 2025. Time will remain the same.

REFER TO THE DRAWINGS:

Sheet A411:

1. OMIT reference at Detail 3 noting “Steel Bar Grating w/ Checker Nosing”. Treads are concrete filled steel pans per Section Detail BC on Sheet S201.

ADDENDUM SPECIFICATION SECTIONS:

Section 00 11 16 - Invitation to Bid, Section 00 41 13 - Bid Form - Stipulated Sum (Single prime Contract), Section 23 09 93 - Control Sequences, Section 23 74 33 - Dedicated Outdoor Air System, Section 26 32 13 - Diesel Engine-Driven Generator Sets, and Section 26 36 23 - Automatic Transfer Switches dated 03-06-2025 are attached to this addendum and are made a part of the Bid Documents.

REVISED DRAWINGS:

Sheets T120, A100, A101, A110, A120, A130, A201, A310, A320, A321, A322, A410, A620, S100, S101, S102, S103, S201, E001, E201, E301, E302, E401, E501, E601, F001, F101, M101, M102, M201, M301, M401, M501, P101 and P201 of original issue date 02-14-2025 and revised 03-06-2025 are attached to this addendum and are made a part of the Bid Documents.

END OF ADDENDUM NO. 1

Craighead Electric	03/06/25
Maintenance Shop Addition	ADD#1
PROJECT NO. 24-096	

The scope of this Addendum is to revise the originally issued construction documents for the Craighead Electric Maintenance Shop Addition dated 02/14/25, and all the subsequent contract modifications to reflect the following:

Summary of Changes

- Response to Bid Questions

SPECIFICATIONS

Section 23 09 93 – CONTROL SEQUENCES

1. New specification section.

Section 23 74 33 – DEDICATED OUTDOOR AIR SYSTEM

1. This section to replace original section 23 74 33 in its entirety.

Section 26 32 13 – DIESEL ENGINE-DRIVEN GENERATOR SETS

1. This section to replace original section 26 32 13 in its entirety.

Section 26 36 23 – AUTOMATIC TRANSFER SWITCH

1. This section to replace original section 26 32 13 in its entirety.

CIVIL

SHEET C002 – UTILITY PLAN

Detail 1 – OIL INTERCEPTOR DETAIL AND GREASE TRAP

1. Add second sand trap at north end of building. Revise sewer service north end of building. Add 1” water service to north end of building.

ARCHITECTURAL

SHEET A100 – ARCHITECTURAL SITE PLAN

Detail 1 - ARCHITECTURAL SITE PLAN

1. Removed fencing and gate SOW and revise keynotes
2. Removed fencing and gate SOW and revise keynotes
3. Show site concrete saw cutting extents, add note
4. Revise extents of Mechanical Yard

SHEET A101 – ENLARGED ARCHITECTURAL SITE PLAN AND SITE DETAILS

Detail 1 - ENLARGED ARCHITECTURAL SITE PLAN

1. Revise equipment pad and bollards

Detail 5 - CHAIN LINK FENCE TOP & BOTTOM

1. Detail Removed

Detail 6 - CHAINLINK FENCE

1. Detail Removed

Detail 8 - CHAINLINK FENCE POST

1. Detail Removed

Detail 9 - CHAINLINK GATE

1. Detail Removed

SHEET A110 – DIMENSIONED FLOOR PLAN

Detail 1 - DIMENSIONED FLOOR PLAN

1. Show location of pit drains, revise end wall to be CMU, remove 4” CMU wall, add dimensions
2. Revised dimension
3. Added CMU wall, door locations and dimensions

4. Added dimension
5. Added dimension

SHEET A120 – NOTED FLOOR PLAN
KEYNOTE LEGEND
1. Add keynote “22.03”

Detail 1 - NOTED FLOOR PLAN
1. Revise location of pit drain and, add keynote, End wall revised to be CMU
2. Revise location of pit drain, Add keynote
3. Revise end wall to be CMU

Detail 3 - LOCKER ELEVATION
1. Added alternate pricing for Z style double lockers

SHEET A130 – REFLECTED CEILING PLAN
Detail 1 - REFLECTED CEILING PLAN
1. Revised ceiling height at “OFFICE - 117”, “SUPERVISOR OFFICE - 118”, “TOILET – 120”, and “TOILET – 121”

SHEET A201 – EXTERIOR ELEVATIONS
KEYNOTE LEGEND
1. Add KN 04.04

Detail 2 – EAST ELEVATION
1. Show mechanical louver, add Keynote
2. Show mechanical louver, add Keynote
3. Keynote removed
4. Keynote added

SHEET A310 – BUILDING SECTIONS
Detail 1 - BUILDING SECTION
1. Add CMU to end wall
2. Add CMU to end wall

Detail 2 - BUILDING SECTION
1. Add CMU to end wall
2. Add CMU to end wall

SHEET A320 – WALL SECTIONS
Detail 3 - WALL SECTION
1. Entire detail revised

Detail 4 - WALL SECTION
1. Entire detail revised

SHEET A321 – WALL SECTIONS
Detail 4 - WALL SECTION
1. Entire detail added

SHEET A322 – EXTERIOR DETAILS
Detail 2 – FOUNDATION DETAIL
1. Revised CMU and note

SHEET A410 – ENLARGED PLANS

Detail 1 - ENLARGED OFFICE PLAN
1. Add dimensions, revise door locations
2. Add CMU end wall
3. Added dimension

Detail 2 - ENLARGED MEZZANINE PLAN
1. Add CMU end wall

SHEET A620 – WINDOW LEGEND, DOOR SCHEDULE & DETAILS
DOOR SCHEDULE
1. Revise doors 105A and 116A
2. Add doors 105C and 116C

STRUCTURAL
SHEET S101 – FOUNDATION PLAN
Detail 1 – FOUNDATION PLAN
1. Revised Pit drain location in wash bay (between gridlines 1&2)
2. Moved “endwall” column footing locations 2’-8” (plan) east from gridline 13
3. Specified 6” slab thickness in wash bay (between gridlines 1&2)
4. Added 12” CMU partition walls along gridlines 2 & 8 (sections & details on S102)
5. Added exterior Generator slab shown in correct location (sections & details on S102)

SHEET S102 – FOUNDATION DETAILS
Detail 1 – SECTION “E”
1. Revised rebar in interior CMU wall footing

Detail 2 – SECTION “J”
1. Revised Pit Drain Depth to 4’-0” Clear

Detail 3 – SECTION “K”
1. Added new section to detail CMU partition walls

Detail 4 – SECTION “L”
1. Added new section to detail Generator slab & turndown

Detail 5 – Housekeeping Pad Detail
1. Revised Housekeeping pad detail to encompass all housekeeping pads to be built (Dimensions of mezzanine pads included in note above detail)

SHEET S201 – MEZZANINE FRAMING PLAN
Detail 1 – HANGING HVAC STRUCTURE DETAIL
1. Added detail outlining a hanging angle structure to support HVAC equipment over office areas (others to provide hanging HVAC unit weights to PEMB supplier for adequate PEMB member sizing)

MECHANICAL
SHEET M101 – HVAC FLOOR PLAN
Detail 1 – HVAC FLOOR PLAN
1. Revise kitchen hood manufacturer.
2. Revised keyed notes where indicated.

SHEET M102 – MEZZANINE MECHANICAL PLANS
Detail 1 – MEZZANINE HVAC PLAN
1. Added louvers L-6 and L-7.
2. Added keyed note 16.

SHEET M201 – MECHANICAL PIPING FLOOR PLAN
Detail 1 – MECHANICAL PIPING FLOOR PLAN
1. Updated floor plan to reflect architectural changes.

SHEET M301 – MECHANICAL SECTIONS
Detail 2 – SHOP AREA DUCTWORK SECTION
1. Added manual balancing dampers in exhaust ducts.

SHEET M401 – MECHANICAL DETAILS
Detail 20 – DOAS-2 AND DOAS-3
1. Revised note on detail 20/M401.

SHEET M501 – MECHANICAL SCHEDULES
1. Added L-6 and L-7 to louver schedule.

PLUMBING
SHEET P101 – SANITARY SEWER PLAN
Detail 1 – SANITARY SEWER PLAN
1. Rerouted drain line at Wash Bay for new location of drain pits.
2. Added Keyed note number five.

SHEET P201 – DOMESTIC WATER PLAN
Detail 1 – DOMESTIC WATER PLAN
1. Rerouted domestic water mains to accommodate ceiling heights.

ELECTRICAL
SHEET E001 – ELECTRICAL NOTES, LEGEND, & INDEX
LIGHTING FIXTURE SCHEDULE
1. Revised model number of Lighting Fixtures “J thru J3” to remove the indirect lighting component.

SHEET E201 – ELECTRICAL LIGHTING PLAN
Detail 1 – ELECTRICAL LIGHTING PLAN
1. Updated floor plan to reflect architectural plan changes.

SHEET E301 – ELECTRICAL POWER & SYSTEMS PLAN
Detail 1 – ELECTRICAL POWER & SYSTEMS PLAN
1. Revised size of the generator.
2. Revised circuit numbers for air compressors and air dryers.
3. Revised circuit number for overhead crane.
4. Revised circuit numbers for 4-post and 2-post truck lifts.
5. Revised keyed notes.
6. Revised circuit numbers for generator battery charger and block heater.
7. Added keyed note for relocation of existing fiber optic conduit stub-up.

SHEET E302 – ELECTRICAL MEZZANINE AND ENLARGED PLANS
Detail 1 – ENLARGED ELECTRICAL ROOM
1. Added Panel “EQ1”.
2. Relocated electrical equipment around room.
3. Re-sized enclosure for Automatic Transfer Switch and panel “EDP”.

Detail 3 – FAB SHOP ENLARGED PLAN
1. Revised circuit number of Plasma Cutter.

SHEET E401 – HVAC EQUIPMENT POWER PLAN
Detail 1 – HVAC EQUIPMENT POWER PLAN

1. Added power for Louvers L-6 & L-7.
2. Revised keyed notes for louver/exhaust fan interlocking.
3. Added keyed note for louver/exhaust fan interlocking.

HVAC EQUIPMENT CIRCUIT SCHEDULE
1. Revised circuit numbers for DOAS-1 & DOAS-1 Pre-Heater.
2. Revised circuit numbers for HRU-1 & HRU-D1.
3. Added power for Louvers L-6 & L-7.

SHEET E501 – ELECTRICAL ONE-LINE DIAGRAM
Detail 1 – ELECTRICAL ONE-LINE DIAGRAM
1. Moved panels “MP1 & EQ1” from being fed from “EDP” to “MDP”.
2. Moved plasma cutter from being fed by “MDP”.
3. Revised breaker and feeder size for panel “EQ1”.
4. Revised breaker and feeder size for Normal and Emergency side of Automatic transfer switch.
5. Revised automatic transfer switch size.
6. Revised panel “EDP” rating and feeder size.
7. Added HRU-1 & HRU-D1 being fed from panel “EDP”.
8. Revised generator and generator breaker size.
9. Revised feeder for feeder tags #2 & #10.
10. Revised text for floor plan consistency.
11. Revised breaker and feeder size for panel “MP2”.

SHEET E501 – ELECTRICAL PANEL SCHEDULES
ALL PANELBOARD SCHEDULES
1. Revised interrupting rating of all panelboards.

PANEL SCHEDULE “MDP”
1. Revised breaker size for “EDP”.
2. Added “MP1” and “EQ1” to being fed from “MDP”.
3. Decreased feeder size for “EQ1”.

PANEL SCHEDULE “EDP”
1. Revised amperage rating and model number of the panelboard. Revised model number utilizes a smaller enclosure.
2. Added HRU-1 & HRU-D1 to being fed from “EDP”.
3. Increased feeder size for “MP2”.

PANEL SCHEDULE “EQ1”
1. Moved air compressors, air dryer, overhead crane, 4-post and 2-post truck lift circuits from panel.
2. Added plasma cutter, generator battery charger and block heater circuits to panel.
3. Revised amperage rating of the panelboard.

PANEL SCHEDULE “MP1”
1. Moved DOAS-1 and DOAS-1 Pre-heater circuits from panel.
2. Moved HRU-1 and HRU-D1 circuits from panel.

PANEL SCHEDULE “MP2”
1. Moved generator battery charger and block heater circuits from panel.
2. Added air compressor, overhead crane, 4-post and 2-post truck lifts, air dryer, DOAS-1, and DOAS-1 pre-heater circuits to panel.
3. Added louver L-6 and L-7 circuiting to panel.

FIRE PROTECTION

SHEET F101 – FIRE PROTECTION FLOOR PLAN

Detail 1 – FIRE PROTECTION FLOOR PLAN

1. Added keyed note 9.

End of ADD #1

1.01 Sealed bids for construction of a New Maintenance Shop Addition will be received until 2:00 PM, Local Time on Friday, March 14, 2025, in the Main Conference Room of the Craighead Electric Cooperative Corporation at 4314 Stadium Blvd, Jonesboro, AR 72404.

A. Bids will be received and reviewed by the Owner privately. They will not be opened publicly and read aloud.

B. Telephones and private office space **WILL NOT** be available for use by bidders.

1.02 There will be no pre-bid conference but contractors may schedule a site visit by contacting Jason Gazaway at Gazaway & White Commercial Real Estate, (870) 236-1115. **The Owner reserves the right to schedule any meetings.**

1.03 The work includes Site Preparation and Improvements, General Construction, Mechanical Work, Plumbing Work and Electrical Work, all to be let under one prime contract.

1.04 **Bid Security:** A cashier's check or acceptable bidder's bond payable to the Owner in an amount not less than 5% of the base bid submitted must accompany each bid as a guarantee that, if awarded the contract, the bidder will promptly enter into a contract and execute such bonds as may be required. If a Bid Bond is provided, the Bond must be signed by an authorized agent of the Bonding Company and the agent's power of attorney must be submitted with the Bid Bond.

1.05 Copies of drawings, specification and other proposed contract documents are on file and are open to inspection at the following places.

Wittenberg, Delony & Davidson, Inc.
Southern Reprographics Plan Room

1.06 Prime Bidders may obtain up to one (1) full-sized set of Bidding Documents from Southern Reprographics, Inc., 901 West 7th, Little Rock, Arkansas 72201, Tel: 501-372-4011, upon deposit by means of a credit/debit card, on account, or check in the amount of **$100** per set, payable to Wittenberg, Delony & Davidson, Inc. Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return paper Bidding Documents in good condition within ten (10) days after receipt of Bids. A Bidder receiving a Contract award may retain paper Bidding Documents, and the Bidder’s deposit will be refunded. Additional sets or partial sets of Bidding Documents, including addenda, may be obtained for the actual cost of printing, shipping and handling, and will be non-refundable. Prime Bidders may also obtain Bidding Documents in electronic format through Southern Reprographics at www.sriplanroom.com for a non-refundable fee as pre-determined by level of access.

1.07 Bidders, sub-bidders, material suppliers and other interested parties are encouraged to obtain complete sets of Bid Documents from the Architect. Complete sets of Bid Documents should always be used in preparing bids. Neither the Owner nor Architect assumes responsibility for errors in bidding or misinterpretations of Bid Documents resulting from the use of incomplete sets of Bid Documents. The documents obtained through the Architect are considered the official version and take precedence if any discrepancies occur. The use of incomplete or inaccurate Bid Documents does not relieve the bidder of the obligation to perform all work related to his bid as detailed in a complete set of Bid Documents.

1.10 All bidders shall conform to the requirements of Arkansas Code Annotated 17-25-101, Arkansas State Licensing Law for Contractors.

1.11 The Owner reserves the right to waive any formalities in, or to reject any or all bids.

1.12 No bidder may withdraw his bid within 60 days after the date of the opening thereof.

1.13 Each bid must be submitted in a sealed envelope bearing, on the outside, the name of the bidder, their Arkansas Contractor License number, their address and the project name.

END OF DOCUMENT 00 11 16

CRAIGHEAD ELECTRIC COOPERATIVE CORPORATION
NEW MAINTENANCE SHOP ADDITION
Bid Date: March 14, 2025
Bid Time: 2:00 PM
Jonesboro, Arkansas
WDD Project No.: 24-096

Proposal of _____
(Hereinafter called "Bidder"): (Strike Out Following Inapplicable Items)

1. An _____ Corporation,
   (State)
2. A Partnership, or

3. An Individual doing business as _____

To: **Craighead Electric Cooperative Corporation**

Gentlemen: Bidder, in compliance with bid solicitation for a **New Maintenance Shop Addition, Jonesboro, Arkansas**, having examined plans and specifications with related documents and site of the proposed Work, and being familiar with all conditions surrounding proposed project, including availability of materials and labor, hereby proposes to furnish labor, materials, and supplies, and construct project in accordance with Contract Documents, within time set forth therein, and at prices stated below. Prices are to cover all expenses incurred in performing Work required under Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on date specified in written "Notice to Proceed" and fully complete project within _____ consecutive calendar days.

Bidder acknowledges receipt of the following addenda:

No._____ Date:_____ No._____ Date:_____ No._____ Date:_____

No._____ Date:_____ No._____ Date:_____ No._____ Date:_____

BASE BID: Bidder agrees to perform all Work described in the Project Manual and shown on the

Drawings for the sum of _____

_____Dollars ($_____).

LIST OF UNIT PRICES

The Bidder shall **include in the Base Bid** the following lump sum allowances computed based upon the quantities listed and unit costs indicated. Unit prices include all Contractor cost including labor, material, General Conditions and overhead and profit. Bidder understands that the Owner reserves the right to review and or negotiate Unit Prices that are deemed to be not in accordance with current market value of proposed services.

In the event the actual quantities are greater or less than the given volumes, the unit prices stated will be used to adjust the contract accordingly.

1. **Unit Price No. 1:** Undercut and related replacement fill.

   Unit Price per Cubic Yard: $ _____ per CY

2. **Unit Price No. 2:** For importing, placing and compacting select fill material at undercut areas only. This is in addition to the fill material required to establish grades shown on the drawings which is to be included in the Base Bid.

   Unit Price per Cubic Yard: $ _____ per CY

LIST OF SUBCONTRACTORS

I, the undersigned General Contractor, certify that proposals from the following subcontractors were used in the preparation of my proposal. I agree that if I am the successful bidder, and if following subcontractors are approved, I will not enter into contracts with others for these divisions of the Work without written approval from Architect and Owner.

NAME: LICENSE NO.

MECHANICAL: _____

PLUMBING: _____

ELECTRICAL: _____

ROOFING AND SHEET METAL: _____

PRE-ENGINEERED STRUCTURE: _____

Bidder understands that Owner reserves right to reject any or all bids and to waive any formalities in the bidding. Bidder agrees bid shall be good and may not be withdrawn for period of sixty (60) days after scheduled closing time for receiving bids.

Upon receipt of written notice of acceptance of bid, Bidder will execute formal contract within ten (10) days and deliver Surety Bond or Bonds as required by Document 00 61 13.

Bid security attached in amount of 5% of base bid is to become property of Owner in event above contract and bond are not executed within time set forth above as liquidated damages and additional expenses to Owner.

By:_____ Date:_____

(Typed Name)

_____ Contractor License No._____

(Signature)

_____

(Title)

_____

(Business Address)

_____

(Seal - If bid is by a Corporation)

END OF DOCUMENT 00 41 13

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CONTROL SEQUENCES

1.01 VRV FAN COIL UNITS (FC-01 THROUGH 09, AND HRU-1)

A. Mode of operation:

1. The unit shall be set and locked in auto mode at the thermostat so that both heating and cooling operation can occur as required to maintain the space temperature at setpoint. The system mode shall be either occupied or unoccupied based on a building automation system (BASs) schedule, an operator override command from the BAS, or a temporary occupancy override signal from the space temperature sensor. Commands or overrides from the BAS shall take priority over any local changes made at the space sensor.

B. Occupied mode:

1. The system shall allow for either local control (setpoint input at thermostat) or BAS control (setpoint input at BAS) of the setpoint. The space temperature sensor shall be set for a single occupied space cooling temperature setpoint. The occupied space temperature heating setpoint shall be calculated using an offset differential value of 3°F (adj). The initial occupied space temperature cooling setpoint shall be 72°F (adj). The initial occupied space heating setpoint is automatically set to 69°F based on the 3°F differential value. The occupied space temperature setpoint range shall be limited to within +/-2°F of the unoccupied space temperature setpoints.

2. The unit fan shall be on continuously during occupied operation.

3. On an increase in space temperature above the occupied space temperature setpoint, the unit electronic expansion valve shall modulate as required to maintain the space temperature at the unoccupied space temperature setpoint. Internal PID loop control of the electronic expansion valve should be utilized to minimize over/undershooting of the space temperature from setpoint.

4. Once cooling operation has been engaged, the unit shall not be allowed to enter into heating operation until the space temperature has fallen 1°F below the occupied space temperature setpoint for at least 15 min. If the space temperature falls more than 2°F below the occupied space

temperature setpoint, the 15 min guard timer delay shall be bypassed and the system shall switch from cooling operation to heating operation.

5. On a decrease in space temperature below the occupied space temperature setpoint, the unit electronic expansion valve shall modulate as required to maintain the space temperature at the unoccupied space temperature setpoint. Internal PID loop control of the electronic expansion valve should be utilized to minimize over/undershooting of the space temperature from setpoint. If the space temperature remains below heating setpoint with the vrv operating in full heating, the auxiliary heat shall be commanded on to meet the space temperature setpoint.

6. Once heating operation has been engaged, the unit shall not be allowed to enter into cooling operation until the space temperature has risen 1°F below the occupied space temperature setpoint for at least 15 min. If the space temperature rises more than 2°F above the occupied space temperature setpoint, the 15 min guard timer delay shall be bypassed and the system shall switch from heating operation to cooling operation.

C. Unoccupied mode:
1. During unoccupied operation, the system shall be subject to the unoccupied mode heating and cooling setpoints. The initial unoccupied heating setpoint shall be 65°F (adj). The initial unoccupied cooling setpoint shall be 80°F (adj).

2. The space temperature sensor shall be equipped with a temporary occupancy override feature that shall override the system into occupied mode for a period of 2 hours (adj).

D. Emergency power mode:
1. During emergency power mode, the BAS shall delay the start of HRU-1 by 30 seconds from the initiation of emergency power.

1.02 DOAS (DOAS-1 AND HRU-D1)

A. Airflow control: constant air volume
1. Supply air fan maintains constant speed to provide setpoint airflow rates for low and high-speed during operation time. Fan speeds will automatically adjust to compensate for changes in air density due to temperature fluctuations and to overcome filter loading.

B. Temperature and humidity control

1. Unit controller sends delta dew point value to Daikin's control box to adjust DX coil and HGRH coil valves to maintain set point for discharge air temperature and humidity control.

1.03 SHOP BAY VENTILATION

A. Occupied mode
   1. During the occupied mode, exhaust fans EF-4 and 5, along with DOAS-2 and 3, and HRU-D2 and D3 shall be energized. The dampers for associated intake louver l-2 and exhaust louver l-3 shall be opened. The damper for auxiliary intake louvers l-6 and 7 shall be closed.

B. Unoccupied mode
   1. During the unoccupied mode, exhaust fans EF-4 and 5, along with DOAS-2 and 3, and HRU-D2 and D3 shall be de-energize. The dampers for associated intake louver l-2, auxiliary intake louvers l-6 and 7 and exhaust louver l-3 shall be closed.

C. Emergency power mode
   1. During the emergency power mode, exhaust fans EF-4 and 5 shall be energized. The dampers for associated intake louver l-2, auxiliary intake louvers l-6 and 7, and exhaust louver l-3 shall be opened. DOAS-2 and 3, and HRU-D2 and D3 shall be de-energized.

1.04 FAB SHOP 102 WELDING HOOD

A. During welding or plasma cutting operations, exhaust fan EF-3 shall be manually energized using a wall mounted timer switch. The dampers for associated intake louver l-4 and exhaust louver l-5 shall be opened. When timer switch is off, exhaust fan EF-3 shall be de-energized and the dampers for louvers l-4 and 5 shall be closed.

1.05 STORAGE (IT) CLOSET 115

A. Exhaust fan EF-2 shall be thermostatically controlled with a wall mounted thermostat to 80°F(adjustable).

B. Space temperature shall be sensed by the BAS. If space temperature rises to 90°F, the BAS shall alarm.

1.06 RESTROOM EXHAUST FAN (EF-1)

A. OCCUPIED MODE

1. During the occupied mode, exhaust fan EF-1 shall be energized.

B. Unoccupied mode
1. During the unoccupied mode, exhaust fan EF-1 shall be de-energized.

1.07 ELECTRICAL ROOM 105

A. Mini-split heat pump (DSS/DHP-1) shall be thermostatically controlled to 80°F(adjustable).

1.08 FIRE RISER ROOM 106

A. Electric unit heater, EH-1, shall control space temperature to 80°F(adjustable) using a unit integral thermostat.

B. Space temperature shall be sensed by the BAS. If space temperature drops to 40°F, the BAS shall alarm.

1.09 WASH BAY 125

A. Electric unit heaters, EH-2, 3 and 4 shall control space temperature to 50°F(adjustable) using unit integral thermostats.

B. Space temperature shall be sensed by the BAS. If space temperature drops to 40°F, the BAS shall alarm.

END OF SECTION 23 09 93

SECTION 23 74 33

DEDICATED OUTDOOR AIR SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes Dedicated Outdoor Air System (DOAS) units for indoor applications.

1.02 SUBMITTALS

A. Product Data: Submit product data for specified products with the following information.

B. General layout drawing with plan and elevation views including all relevant dimensions.

C. Performance schedule including airflow, heating and cooling capacities, electrical data, unit weight.

D. Full fan curve.

E. Sound power data by octave band for all openings and radiated through the cabinet.

F. Electrical schematics including field wiring connections.

G. Component details including construction method and materials.

H. Control point schematic and complete written sequence of operation.

1.03 QUALITY ASSURANCE

A. Entire unit shall be UL 1995 certified and bear certification label by ETL, UL or CSA.

B. Unit shall meet ASHRAE Standard 90.1 performance requirements.

C. Unit sound data will be tested in accordance with AHRI 260.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store equipment away from construction areas where it may be damaged and protected from harmful weather conditions.

B. Keep factory shipping packaging in place until unit is ready to be installed.

C. Follow manufacturer's instructions for rigging and placement of equipment.

1.05 COORDINATION

A. Coordinate all system connections and building penetrations including electrical and duct connections.

1.06 WARRANTY

A. Standard Warranty for the Unit (Parts only): 24 months (2 years) from shipment date

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project plans and specifications the following manufacturers are approved to supply products.
   1. Acceptable Manufacturers
      a. Oxygen8

B. DOAS Units
   1. DOAS units shall be factory assembled and tested. Units shall include insulated steel cabinet, split DX coil, split HGRH coil, electric heat, fan and motor assembly, filter rack, and integral controls.

C. CABINET
   1. Cabinet shall be nominal 1-inch double wall panel with R6.5 thermal insulation. Cabinet exterior shall be 22-gauge pre-painted steel that meets or exceeds 650-hour salt spray test based on ASTM B117. Liners and other steel components shall be galvanized steel. All seams shall be sealed to provide airtight casing.
   2. Doors shall be nominal 1-inch double wall panel with the same construction as cabinet. Doors shall be fitted with hinges and door handles. The doors shall have one lockable handle as standard.

D. The unit will be designed for service and maintenance on the bottom side for major components and front for filter and control panel access only to allow for a compact installation.

2.02 FILTERS

A. Unit shall include 2-inch filter rack for the outdoor air path upstream of the DX cooling coil. Filters shall be accessed through hinged filter access door. Supply one set of MERV 13 pleated filters for the outdoor air stream. All filters must be UL approved.

B. Provide factory mounted pressure sensors to measure filter pressure drop across filters. Pressure drop shall be digital feedback to controller for utilization in control and alarm sequencing. Unit controller shall monitor filter pressure level and report when filter changes are required.

2.03 FANS

A. Fans shall be mixed flow plenum type with direct drive motor. Fan and motor assembly shall be factory mounted and balanced. The fans will be capable of operating in ambient temperatures of up to 40°C.

B. Fan motors shall be permanent magnet, synchronous motor type with integral digital motor controller. Fan bearings shall be serviceable type with an L-10 life of 40,000 hours. Fan motors will be UL approved.

C. All fans shall be equipped with integral airflow monitoring system connected to the unit controller.

D. Provide means to easily remove fan-motor assembly for service through standard doors.

E. Fans should be designed such that all service can be performed in the field, including replacement of bearings.

F. Fan motor drives shall be 208/60/3 or 208-230/60/1 and be UL approved. Fans will be protected by UL approved motor protection circuit breaker.

2.04 ELECTRIC HEATING COIL

A. Provide open coil electric heaters of the size, capacity and performance shown in the equipment schedules.

B. All duct heaters shall be tested and certified to UL and CSA.

C. Frame to be corrosion-resistant and made of galvanized steel.

D. Coils shall be made of high-grade Nickel-Chrome alloy and shall be insulated from the frame by means of non-rotating ceramic bushings.

E. Heater to come with door mounted disconnect switch and air proving switch

F. SCR control is time proportioning type that modulates the heater and supplies the exact amount of power to match the demand. Input signal will be 0-10V.

G. Heaters shall be equipped with a fail-safe automatic reset disc-type thermal cut-out located in the top frame component above the heating element.

H. Duct heaters shall be non-sensitive to air flow direction and interchangeable for horizontal or vertical ducts without impairing safety.

2.05 DX HOT GAS REHEAT COIL

A. Where indicated, unit shall include AHRI 410 tested fin tube type DX coil for use with R-410A. Fins shall be aluminum with a minimum thickness of 0.0060". Tubes shall be 3/8" OD, 0.013" tube wall seamless copper tube mechanically expanded into fins. Coil shall have interlaced circuits to match remote condensing unit when required. Coil casings shall be galvanized steel. Coils shall include external drain and vent connections. Coil shall be mounted in a rack over a stainless-steel double sloped condensate pan. Coil shall be shipped with nitrogen holding charge and tested to 700 psi.

B. When VRV integration is used, the AHU integration controller (EKEQ) must be factory mounted and wired to EKEXV expansion valve kit.

C. Liquid and Gas thermistors are to be mounted to coil and wired to EKEQ kit in the factory.

D. EKEXV expansion valve kit will be mounted, and connections will be brazed to coil. Liquid and Gas lines to be capped at outside of AHU. Coil and EKEXV kit must be tested to 400 psi, and then nitrogen charged for shipment to site.

2.06 CONTROLS

A. Unit shall include an integrated microprocessor-based unit controller. The controls shall be located in the electrical panel. All unit controls shall operate off a transformer from the main power supply for single point power connection. All internal controls and sensors shall be factory prewired and tested.

B. The control system will regulate temperatures, airflows and other functions as required. Unit controller shall be pre-programmed with factory tested software for all possible functions.

C. The controller shall provide the following, refer to sequence of operation for specific unit control sequences;

1. Control of fans correcting for both changes in total static pressure and air density in both VAV and constant airflow applications.
2. Fan performance monitoring.
3. Ventilation airflow monitoring and control.
4. Airflow density correction for winter and summer conditions.
5. Energy recovery optimization including operation of bypass damper.
6. Supplemental heating and cooling when included.
7. Frost protection.
8. Monitoring alarms, faults and maintenance points including filter changeout.
9. Time and date schedules.
10. Humidity control.
11. Data logging and trending.

D. Include wireless capability that will allow the client to access remotely via internal wi-fi network.

E. If non factory controls are proposed as an option, a factory witness test is required to show integration and functionality.

F. Controller shall be BACnet IP and BTL certified and include Modbus communication. Communication shall include monitoring, control, alarms, faults and maintenance information.

G. Provide factory installed and tested contactors, overloads, fusing, starters motor speed controllers for supply fans. Include all necessary control transformers.

H. Provide unit mounted non-fused disconnect switch with single point power connection.

I. Supply all necessary temperature and pressure sensors complete with plug in wiring harnesses for proper option of unit.

J. When VRV integration is used, the AHU integration controller (EKEQ) must be factory mounted and wired to EKEXV expansion valve kit.

K. Liquid and Gas thermistors are to be mounted to coil and wired to EKEQ kit in the factory.

2.07 PLASTIC COMPONENTS

A. All plastic components that are in the airstream, must be of a UL94 rated material.

B. If gasketing is used to join unit sections together, gasketing must be a UL94 approved compound.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer instructions, these specifications, best practices, and all applicable building codes.

3.02 START UP SERVICE

A. Engage factory authorized service technician to start up and commission units. Provide start up report to owner.

END OF SECTION 260519

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Diesel engine.
2. Diesel fuel-oil system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure (where selected).
7. Vibration isolation devices (where applicable).

B. Related Requirements:

1. Section 26 36 23 "Automatic Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.02 DEFINITIONS

A. AEPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour (liters per hour) at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per minute (cubic meters per minute) at 0.8 power factor, Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight for provided components; fuel tank, enclosure, silencer, base tank, each piece of equipment not integral to the engine generator.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams indicating terminal markings for engine generators and functional relationship between all electrical components.
7. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report. Perform tests at rated load and power factor. Provide the following test results:

    a. Maximum Power Level
    b. Maximum Motor Starting (sKVA)
    c. Structural Soundness
    d. Torsional Analysis
    e. Transient Response
    f. Alternator Temperature Rise
    g. Engine Cooling Requirements (unit mounted radiator)
    h. Harmonic Analysis (per IEEE-115 and ANSI-100)
    i. Voltage Regulation
    j. Endurance Testing
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Report of factory test on units to be shipped for this Project, indicating evidence of compliance with specified requirements.
4. Report of sound generation.
5. Report of exhaust emissions indicating compliance with applicable regulations.
6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports. Field start up report and unit in-service documentation, including load bank test results if applicable.

D. Generator shall be mounted and anchored to meet the requirements of Specification Section 26 04 48.16 “Seismic Controls for Electrical Systems”.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. Include manufacturer's recommended maintenance and periodic testing plan in accordance with NFPA 110, Chapter 8.

B. Furnish extra materials required by local Authority Having Jurisdiction (AHJ) and defined in project documents that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.06 QUALITY ASSURANCE

A. The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in accordance with all applicable standards below:

1. CSA C22.2, No. 14-M91 Industrial Control Equipment.

2. CSA C22.2, No. 100 Motors and Generators
3. CSA 282-15
4. EN 61000-6
5. EN 55011
6. FCC Part 15 Subpart B
7. ISO 8528
8. IEC 61000
9. UL 508
10. UL 2200
11. UL 142
12. UL 6200
13. Designed to allow for installed compliance to NFPA 37, NFPA 70, NFPA 99 and NFPA 110

B. Manufacturer Qualifications:

1. Current certificate holder for ISO 9001 compliance.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 25 years and who maintains a service organization of factory-authorized generator technicians available twenty-four hours a day throughout the year.
3. Manufacturing and assembly of products must be done in the United States using domestically sourced materials to the extent practical.

C. Installer Qualifications: An authorized representative who is trained and certified by the manufacturer on stationary power systems.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty: 5 Year Comprehensive from date of Substantial Completion.
2. A Comprehensive Warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for covered warranty repairs during the listed warranty period. A Limited warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for the first 2 years and then replacement parts for the remainder of the listed warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Generac Power Systems, Inc.; 150 kW, 6.7L with a K0250124Y21 - 250kW alternator. The Three Phase generator shall be rated for 150 kW at 208 volts and 60 Hz, at 0.8 power factor lagging while operating at a maximum ambient temperature of 110 Fahrenheit and maximum altitude of 6000 feet above sea level without reduction in electrical output capacity. Comparable products by one of the following will also be considered:

1. Kohler Power Systems.

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer. "Source Limitations: Obtain packaged engine generators and auxiliary components from single supplier. The equipment supplied and installed shall meet the requirements of NEC and all applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory certified service personnel.

C. Requests for substitutions shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data and a completed generator sizing model using the proposed manufacturer's generator sizing software shall accompany each request and authorized acceptance shall be addenda only. Should any substitutions be made, the contractor shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2.02 PERFORMANCE REQUIREMENTS

A. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 99.
4. Comply with NFPA 110 requirements for Level 1 EPSS.

B. UL Compliance: Engine generator assembly and factory enclosure (if provided) shall be UL 2200 listed.

C. Engine Exhaust Emissions: Comply with applicable US EPA, State and Local Government requirements. Diesel Stationary Emergency: Engines shall be certified by the manufacturer to comply with 40 CFR Part 60 Subpart IIII.

2.03 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Power Rating: Standby.

D. Service Load: The generator set shall be a Generac model 150 kW, 6.7L with a K0250124Y21 - 250kW alternator. It shall provide 150 kW and 187.5 kVA while operating at the maximum ambient operating temperature and elevation specified in the project documents.

E. Power Factor: 0.8 lagging.

F. Frequency: 60 Hz.

G. Voltage: 208 Volts ac.

H. Phase: Three Phase, Four Wire.

I. Induction Method: Turbocharged.

J. Governor: Adjustable isochronous, with speed sensing.

K. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

L. Nameplates: For each major system component to identify manufacturer's name, model and serial number of component.

M. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 8.17 percent variation for 50 percent step-load increase or decrease at unity power factor. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Less than 2.8 Hertz variation for 50 percent step-load increase or decrease at unity power factor. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined in accordance with NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start time to comply with NFPA system requirements.

2.04 ENGINE PERFORMANCE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15. Engine shall be capable of operating on hydrotreated vegetable oil blends (up to HVO 100) conforming to the EN 15940 specification without modification.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System to be engine mounted.
1. Oil filter shall be engine-mounted replaceable cartridge type with integral bypass valve, in accordance with manufacturer recommendations.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Jacket water heater shall be sized per NFPA110 and UL listed to ensure that genset will start within the specified time period and ambient conditions.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gauge glass and petcock.

3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Maximum Ambient Operating Temperature on Radiator: 122 degrees F (50 degrees C).
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. Meets SAE 100R1A Type S, EN853 1SN, ISO 1436-1 Type 1SN
    c. a Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:
1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

G. Air-Intake Filter: Heavy duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12 or 24-V electric, with negative ground.
1. Cranking Cycle: As required by NFPA 110 for system level specified.
2. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle as required by NFPA 110 for system level specified.
3. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 minimum continuous rating.
4. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and NFPA 110 Section 5.6.4.6 for Level 1 systems.:

2.05 FUEL SYSTEM – DIESEL

A. Comply with NFPA 37.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel. Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 2 microns.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:

1. Tank level indicator.
2. Fuel-Tank Capacity: Sized for 24 running hours at 100% of rated generator load between fuel refills.
3. Leak detection in interstitial space.
4. Vandal-resistant fill cap.
5. Containment Provisions: Comply with requirements of authorities having jurisdiction. Secondary containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a primary tank rupture.
6. Normal and emergency vents on the main tank and secondary containment space, sized according to UL 142.

2.06 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

D. Control panel must comply with UL 6200. The controller shall meet ASTM B117 (salt spray test).

E. Connection to Building Management: Provide connections for data transmission of indications to remote data terminals via Modbus.

F. Environmentally Hardened Design: Open circuit boards, edge cards, and PC ribbon cable connections are unacceptable.

G. PCB Construction: Circuit boards with surface-mounted components to provide vibration durability. Circuit boards utilizing large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

H. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel powered from the engine generator battery.

I. Control and Monitoring Panel:

1. Digital engine generator controller with integrated touch screen, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.

2. Instruments: Located on the control and monitoring panel and viewable during operation.
   a. Engine lubricating-oil pressure gauge.
   b. Engine-coolant temperature gauge.
   c. DC voltmeter (alternator battery charging).
   d. Running-time meter.
   e. AC voltmeter, for each phase.
   f. AC ammeter, for each phase.
   g. AC frequency meter.
   h. Generator-voltage adjusting feature.

3. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
   a. Cranking control equipment.
   b. Run-Off-Auto switch.
   c. Control switch not in automatic position alarm.
   d. Overcrank alarm.
   e. Overcrank shutdown device.
   f. Low-water temperature alarm.
   g. High engine temperature pre-alarm.
   h. High engine temperature.
   i. High engine temperature shutdown device.
   j. Overspeed alarm.
   k. Overspeed shutdown device.
   l. Low fuel main tank.
      1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required for the indicated EPSS class.

m. Coolant low-level alarm.
n. Coolant low-level shutdown device.
o. Coolant high-temperature prealarm.
p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. EPS load indicator.
t. Battery high-voltage alarm.
u. Low cranking voltage alarm.
v. Battery-charger malfunction alarm.
w. Battery low-voltage alarm.
x. Lamp test.
y. Contacts for local and remote common alarm.
z. Remote manual stop shutdown device.
aa. Total engine run hours, non-resettable.
bb. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

J. External Alarm & Status Relays: Provide a separate terminal block, factory wired to Form C dry contacts, for each alarm and status condition required by Building Management or other external systems as shown on electrical drawings.

K. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

L. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.

13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent-protective-device not-closed alarm.

M. Remote Emergency-Stop Switch: Provide remote emergency stop switch in quantity and style as shown on electrical drawings. Electrical contractor to coordinate exact location with engineer and local AHJ.

N. Data Logging:

1. Event Logging – the controller keeps a record of up to 8,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a USB storage device or onto a PC through the service program.
2. Event Snapshot – the control system shall capture 15 seconds of critical data around the time a fault or warning. This data shall be viewable on the controller and downloadable.
3. Data Logging – the controller shall allow customized parameters to be logged based on a start trigger from the controller interface.
    a. The parameters are selectable from all monitored parameters.
    b. The sample period shall be configurable from 1 second to 1 day.
    c. The collected data shall be stored on a USB storage device plugged into the control panel.

2.07 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

1. Unit mounted circuit breakers. Rating, ampacity, accessories, as shown on drawings or as listed below:

2. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:
   a. Tripping Characteristic: Designed specifically for generator protection.
   b. Trip Rating: Matched to generator output rating.
   c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   d. Mounting: Adjacent to, or integrated with, control and monitoring panel.

C. Generator Controller Integrated Alternator Protective Functions:

1. Short-time I^2t function : Generator controller-based function shall continuously monitor current level in each phase of alternator output, integrate alternator heating effect over time, and predict when thermal damage of alternator will occur. As overcurrent heating effect on the alternator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits.
2. Long-time function: Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
3. Short-circuit fault clearing: Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.08 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Range: Provide range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity. Stator shall be skewed construction to minimize harmonic voltage distortion.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator:

1. Voltage Regulator: Solid-state type, separate from exciter. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain steady-state generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS. The regulator shall provide an adjustable Volts/Hz slope regulation characteristic in order to optimize voltage and frequency response for site conditions.
2. Alternator Excitation: Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
3. The generator must accept rated load in one-step.
4. Calculated Transient Voltage Performance: Motor starting performance and voltage dip determinations shall be based on the complete generator assembly. Voltage dip shall not exceed 15.4 percent based on the largest project block load, as determined by manufacturer's sizing program.
5. System Transient Voltage Performance: Alternator shall be capable of supplying 557 sKVA with a voltage dip not more than 35% at 0.3 starting power factor. Sustained voltage dip data or manufacturer-published SKVA numbers based on unity PF alternator-only dynamometer testing will not be accepted.
6. Calculated Transient Frequency Performance: Transient frequency dip performance shall be based on the complete generator set. Maintain frequency within 7.3 percent based on largest project block load, as determined by manufacturer's sizing program.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.09 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Basis of design is a Standard Weather Enclosure.

B. Generator packaged within manufacturer's weather protective, sound attenuated enclosure. Enclosure and generator set shall be UL 2200 Listed as a system.

C. Enclosure Construction: Minimum 14 gauge construction. Roof construction shall be raised-seam, gasket-free interlocking panels. Rivets shall not be used on external painted surfaces. Design shall be rodent resistant.

D. Doors shall be equipped with lift-off pin and sleeve type hinges to allow access to the engine, alternator, and control panel. Hinges shall be adjustable for door alignment. Hinges and all exposed fasteners shall be stainless steel. Each door shall be equipped with minimum 2-point latching mechanism and identical keys. Perimeter of all door openings shall include polyethylene gasket.

E. Upward discharging exhaust hood for engine cooling airflow and exhaust.

F. Engine exhaust silencer mounted within enclosure discharge hood.

G. Enclosure Finish: Electrostatic applied powered paint, baked and finished to manufacturer's specifications. Finish system shall be subjected to the following tests:

1. ASTM D1186 - 87; 2.5+ mil Paint Thickness
2. ASTM D3363 - 92a; Material Hardness
3. ASTM D522 - B; Resistance to Cracking
4. ASTM D3359 - B; Adhesion
5. ASTM B117 D 1654; Resistant to Salt Water Corrosion
6. ASTM D1735 D 1654; Resistant to Humidity
7. ASTM 2794 93 (2004); Impact Resistance
8. SAE J1690 - UV Protection"

H. Enclosure Color: Manufacturer's standard color, or custom color matched based on architect's design with color sample provided to generator manufacturer.

I. Wind Rating: Enclosure shall be constructed to attain basic wind speed rating of 110 MPH; WIF 1.15, Exposure Category "C", Building Classification "Enclosed", Topographic Factor Kzt = 1. Wind Design Pressures: windward, 20.6 lb/ft^2; leeward, -12.9 lb/ft^2; roof, -18.0 lb/ft^2."

J. Snow Load Rating: Minimum 70 pounds per square foot.

K. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

L. Sound Insulation: Enclosure and air discharge hood completely lined with reflective silver mylar faced sound attenuating closed cell foam that meets UL 94 HF1 standards for flammability (FMVSS 302 test method). Roof sound insulation panels shall include additional mechanical retention.

M. Sound Performance: The engine generator, while operating at full rated load, shall not exceed 80.00 dBA average measured at 23 ft (7 meters) from the engine generator in a free field environment.

N. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.

O. Convenience Outlet: Factory-wired convenience 120v duplex-outlet within enclosure, GFCI.

2.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment for units with a ratings 750kw or below.

1. Material: Standard neoprene separated by steel shims.

B. Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint for units with a rating larger than 750kw.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 0.5.

C. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdowns.
9. Report factory test results within 10 days of completion of test.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service in accordance with requirements indicated:

1. Notify Project Manager in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without written permission.

3.03 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases or steel dunnage as indicated on drawings.
2. Coordinate size and location of mounting bases for packaged engine generators.
3. Install unit with vibration isolation devices described in section 2.10.

3.04 FIELD QUALITY CONTROL

A. Tests and Inspections: The supplier of the electric generating plant and associated items covered herein shall provide factory certified technicians to inspect the completed installation and to perform an initial startup inspection to include:

1. Ensuring the engine starts (both hot and cold) within the specified time.
2. Verification of engine parameters within specification.
3. Verify no load frequency and voltage, adjusting if required.
4. Test all automatic shutdowns of the engine-generator.
5. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.

B. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

C. Battery and Charger Tests:

1. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions.
2. Verify that measurements are within manufacturer's specifications."

D. System Integrity Tests: Verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest and reinspect as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

3.06 MAINTENANCE SERVICE

A. Repair Service Capabilities:

1. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including: engines, alternators, control systems, paralleling electronics, and power transfer equipment.
2. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 50 miles of the site.

3. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

B. Preventative Maintenance Service Agreement: The supplier shall include as a line item adder in the proposal, a one-year maintenance service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine generator set(s) and the transfer switch(es). This agreement shall include semi-annual preventative maintenance visits to verify operation and/or complete the following:

1. All periodic engine maintenance as recommended by the service manual.
2. All electrical controls maintenance and calibrations as recommended by the manufacturer.
3. All auxiliary equipment as a part of the emergency systems.
4. The supplier shall guarantee emergency service.
5. All expendable maintenance items are to be included in this agreement.
6. A copy of this agreement and a schedule shall be provided in the submittal documents, detailing scope of work and preventative maintenance service visit interval.

END OF SECTION 26 32 13

PART 1 - GENERAL

1.01 SCOPE

Furnish and install automatic transfer switch(es) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Basis of design is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch, Open - In Phase Transfer, 800 A, 3 Pole 4 Wire 480V, Transfer Switch in a NEMA 1 Enclosure. Each automatic transfer shall consist of a mechanically held power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 ACCEPTABLE MANUFACTURERS

Automatic transfer switches shall be Generac TX Series.

1.03 CODES AND STANDARDS

The automatic transfer switches and accessories shall conform to the requirements of:

A. UL 1008 - Standard for Automatic Transfer Switches
B. NFPA 70 - National Electrical Code (2017 version and later for start circuit monitoring)
C. NEC Articles 700, 701, 702, 708
D. NFPA 99 – Health Care Facilities
E. NFPA 110 – Emergency and Standby Power Systems
F. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
G. NEMA Standards ICS10, MG1, MG250, ICS6, AB1
H. ANSI C62.41
I. International Standards Organization: ISO 8528, 9001.
J. Where seismic rating and/or certification is required: IBC 2018, OSHPD

PART 2 – PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH

A. The basis of design is the Generac TX Series Transfer switch that utilities a knife blade mechanically latching design with maintenance free contacts. The transfer switch unit shall be electrically operated and mechanically held. The open

transition switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency. The delayed transition switch shall be mechanically interlocked to ensure one of three possible positions, normal and emergency.

B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

C. All main contacts shall be silver composition. Switches shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

D. A manual operating handle shall be provided for maintenance purposes.

E. Designs utilizing components of or parts thereof which are not intended for continuous duty, repetitive switching, or transfer between two active power sources are not acceptable.

F. Where neutral conductors must be switched, the ATS shall be provided with fully rated neutral transfer contacts.

G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully rated AL-CU pressure connectors shall be provided.

H. The switch shall be capable of the following methods of transfer: Open with In-Phase transition only, Time Delay in Neutral transition, or In-Phase transition with a default to Time Delay in Neutral.

I. The transfer switch shall have a Seismic Certification to the requirements of the international Building Code of electrical equipment.

2.02 ATS CONTROL WITH INTEGRATED USER INTERFACE PANEL

A. The basis of design is the Generac TXC-100 Controller with Integrated User Interface Panel which is voltage agnostic for service purposes removing the need for technicians to carry and support control panels for every available voltage. Any manufacturers that provide a controller or control panel that does not meet this requirement should notify the consulting engineer before bidding.

B. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

C. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and include standard on-board serial communications capability.

D. A user accessible USB port shall be provided to facilitate firmware updates, uploading of switch operational parameters, downloading of event history and switch operational statistics. This USB port shall be front accessible without opening the ATS door.

E. The controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.1Hz. Time delay settings shall be accurate to ±0.5% of the full-scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C.

F. The controller power supply shall be field-configurable to operate on 120V through 480V systems without the need for transformers.

G. Control logic shall be backed up with a rechargeable, user-replaceable lithium-ion battery that shall also maintain control power for up to 60 minutes in the event no source power is available.

H. The controller shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance.

I. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1. IEC 61000 – 4 – 3 Radiated RF Field Immunity
2. IEC 61000 – 4 – 4 Electrical Fast Transient/Burst Immunity
3. IEC 61000 – 4 – 5 Surge Immunity
4. IEC 61000 – 4 – 6 Conducted RF Immunity
5. IEC 61000 – 4 -11 Voltage Dips and Interruptions
6. EN 61000 – 6 - 2 Industrial Immunity Requirements EN 61000-6-4 - Radiated Emissions
7. EN 61000 – 6 - 4 Conducted Emissions
8. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.03 ENCLOSURE

The basis of design is a Generac TX Series Non-Service Entrance Rated Transfer Switch in a NEMA 1 enclosure, with dimensions no larger than 78 Inches in Height, 30 Inches in

Width, and 24 Inches In Depth. Larger enclosures than the basis of design will need to be approved by the Consulting Engineer to ensure there is enough wall space and appropriate clearance.

A. Provide a temperature and humidity controlled anti-condensation heater for all NEMA 3R and 4X enclosed units. Heater shall be an available option on NEMA 1 enclosures, when called for on plans. Heater cover to indicate a hot surface.

B. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.

C. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

PART 3 – OPERATIONS

3.01 CONTROLLER DISPLAY AND KEYPAD

A. A backlit four-line graphical LCD display and human interface shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the RS-485 communications port.

B. All instructions and controller settings shall be easily accessible, readable, and accomplished without the use of codes, calculations, or instruction manuals.

C. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.

D. The following parameters shall only be adjustable only by authorized service personnel:

1. Nominal line voltage and frequency
2. Single or three phase sensing on normal
3. Transfer operating mode configuration, (open transition, or delayed transition)

3.02 VOLTAGE AND FREQUENCY SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip settings capabilities; values shown as percentage of nominal unless otherwise specified.

Voltage and Frequency Settings	**Range**	**Default Value**
Source 1 (Normal) is Genset	Yes or No	No
Source 1 Undervoltage Dropout	50-97%	85%
Source 1 Undervoltage Pickup	52-99%	90%
Source 1 Overvoltage Dropout	105-120%	110%
Source 1 Overvoltage Pickup	103-118%	105%
Source 1 Underfrequency Dropout	90-97%	90%
Source 1 Underfrequency Pickup	91-99%	95%
Source 1 Overfrequency Dropout	103-110%	105%
Source 1 Overfrequency Pickup	101-109%	102%
Source 1 Voltage Imbalance Drop	5-20%	5%
Source 1 Voltage Imbalance Pickup	3-18%	3%
Source 1 Warmup Time	0-1800s	3s
Source 1 Cooldown Time	0-1800s	1800s
Source 1 Minimum Run Time	300-1800s	1200s
Source 2 is Generator	Yes or No	Yes
Source 2 Undervoltage Dropout	50-97%	85%

Source 2 Undervoltage Pickup	52-99%	90%
Source 2 Overvoltage Dropout	105-120%	110%
Source 2 Overvoltage Pickup	103-118%	105%
Source 2 Underfrequency Dropout	90-97%	90%
Source 2 Underfrequency Pickup	91-99%	99%
Source 2 Overfrequency Dropout	103-110%	105%
Source 2 Overfrequency Pickup	101-109%	102%
Source 2 Voltage Imbalance Drop	5-20%	5%
Source 2 Voltage Imbalance Pickup	3-18%	3%
Source 2 Minimum Run Time	300-1800s	1200s
Source 2 Warmup Time	0-1800s	3s
Source 2 Cooldown Time	0-1800s	1800s
Phase Rotation Check	ABC, CBA, OFF	ABC
Supply Overvoltage	350 VAC	Fixed
Manual Return to Normal	Yes or No	
Time Delay Settings		
Transfer to Emergency	120s max	30s
Re-transfer to Normal	1,800s max	1,800s
Time Delay Neutral	120s max	30s
Engine Cool Down	300-1,800s	1,800s
Delayed Transition Time	120s max	120s
Elevator Signal	120s max	30s

In Phase Transfer	Yes or No	
In Phase Synchronization	Time 60-3600s	300s
Preferred Source	S1, S2	S1
Voltage Imbalance Enable	Yes or No	
Voltage Imbalance Timeout	10-30s max	20s

B. Repetitive accuracy of all settings shall be within 1% at +25C.

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via RS-485 communications port access.

D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency.

E. The backlit graphical display shall have multiple language capability. Languages can be selected from the user interface.

3.03 TIME DELAYS

A. A **Line Interrupt** delay shall be provided to override momentary normal source outages, delay all transfer and engine starting signals; adjustable 0 to 120 seconds. It shall be possible to bypass the time delay from the controller user interface.

B. An **Engine Warm Up** delay shall be provided for extended engine RPM stabilization where fast transfer to the emergency source is not required; adjustable 0 to 1,800 seconds. It shall be possible to bypass the time delay from the controller user interface.

C. A **Transfer to Emergency** delay shall be provided for controlled sequencing of loads to the emergency source; adjustable from 0 to 120 seconds. It shall be possible to bypass the time delay from the controller user interface.

D. A **Retransfer to Normal** delay shall be provided to ensure stability of the normal source, adjustable from 0 to 1,800 seconds. Time delay shall be automatically bypassed if the emergency source fails and normal source is acceptable.

E. An **Engine Minimum Runtime** delay shall be provided to reduce nuisance starts when the normal source power is unstable but does not trigger a transfer to the emergency source, adjustable from 5 to 30 minutes. Operates in conjunction with Engine Cool Down delay.

F. An **Engine Cool Down** delay shall be provided; adjustable 300 – 1,800 seconds.

G. A **Delayed Transition** delay shall be provided to ensure sufficient time for motor voltage decay for transition between live sources; adjustable from 0 – 120 seconds.

H. An **Elevator Signal Before Transfer** output signal shall be provided to drive an external relay for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 120 second delay in any of the following modes:
   1. Prior to transfer only.
   2. Prior to and after transfer.
   3. Normal to emergency only.
   4. Emergency to normal only.
   5. Normal to emergency and emergency to normal.
   6. All transfer conditions or only when both sources are available.

I. For special applications (i.e., three sources), the option to select the **Preferred Source**.

J. All adjustable time delays shall be field adjustable without the use of special tools or software.

Time Delay Summary Table:

Time Delay Description	Range	Default Value
Line Interrupt Delay	0 – 120 sec.	3 sec.
Engine Warm Up Delay	0 – 1,800 sec.	3 sec.
Transfer to Emergency	0 – 120 sec.	3 sec.
Retransfer to Normal	0 – 1,800 sec.	1,800 sec.
Engine Minimum Run Time	5 – 30 min.	5 min.
Engine Cool Down	300 – 1,800 sec.	1,800 sec.
Delayed Transition (Center Off Position)	0 – 120 sec.	120 sec.
Elevator Signal Before Transfer	0 – 120 sec.	0 sec.
Preferred Source	Normal (S1), Emerg. (S2)	Normal (S1)

3.04 EXTERNAL CONTROL INTERFACES AND INDICATORS

A. Communications connectors, user interface and display shall be accessible and usable without presenting an arc-flash hazard.

B. Customer inputs shall be optically isolated for wider compatibility with external systems. This will protect the controller from external surges and transient voltages.

C. Surge Protection for the ATS controls shall be provided.

D. Replaceable fuses to protect the power supply to the ATS control panel.

E. A set of contacts rated 5 amps, 30 VDC shall be provided for a low-voltage **engine start** signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output and run for the duration of the Engine Minimum Runtime setting, regardless of whether the normal source restores before the load is transferred.

F. Engine starting contacts shall facilitate start-circuit monitoring to comply with the 2017 and later versions of NFPA 70 Article 700.10 (D)(3).

G. Two sets of Form-C auxiliary contacts rated 10 amps, 250 VAC shall be provided to indicate the switch actuator position, including center-off for Time Delay Neutral switches or a Permissive (Emergency Inhibit) condition.

H. A single **General Alarm** (summary alarm) indication shall light up the alert indicator and de-energize the configured common alarm output relay for external monitoring.

I. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source and one to indicate when the ATS is connected to the emergency source.

J. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency source, as determined by the voltage sensing trip and reset settings for each source.

K. LED indicating light shall be provided to indicate switch not in automatic mode (manual).

L. LED indicating light shall be provided to indicate any alarm condition.

M. The controller shall have two programmable inputs and one programmable output as standard; with an optional expansion board to add up to four programmable input/outputs. Programmable I/O conditions shall include:

Programmable Output	Programmable Input

Source 1 – Two Wire Start	Permissive (Emergency Inhibit)
Source 2 – Two Wire Start	Remote Engine Fast Test
Engine Exercising	Remote Engine Normal Test
Engine Warmup	ATS Timer
Signal Before Transfer	Initiate Demand Response
General Alarm	
Source 1 Good	
Source 2 Good	

N. System Status - The controller LCD display shall include a System Status screen which shall be accessible from any point in the menu system by depressing the "ESC" key until you arrive at the System Status screen. This screen shall display a clear description of the active operating sequences and switch position. Operational status information displayed shall include:
   1. Source 1 status (good or bad)
   2. Source 2 status (good or bad)
   3. Any active timer
   4. Permissive (Emergency Inhibit when active)

3.05 TRANSFER AND EXERCISE CONTROLS

The following standard features shall be built into the controller, capable of being activated through keypad programming as required by the user:

A. Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.

B. An engine generator exercising timer shall be provided to configure daily, day of week, weekly, bi-weekly, or monthly testing of an engine generator set at a specified time of day with or without load for a programmable period (Engine Minimum Runtime).

C. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency for remote test. Test signal can be enabled through the keypad or digital input. Transfer to emergency for demand response can be enabled by digital input.

D. **For In-Phase Transfer Switch Designs:** An in-phase monitor shall be provided in the controller such that the transfer occurs with less than ten degrees phase angle difference between sources. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents and shall not require external control of power sources. In-phase switch transfer time shall not exceed 25ms.

E. **For Delayed Transition Transfer Switch Designs:** Terminals shall be provided for a remote contact to signal the ATS to load-shed (Permissive is removed) and move to a center-off position. When the load-shed signal is removed (Permissive is restored), the ATS shall reclose to the emergency. If normal source is good during load-shed the ATS shall transfer to and remain on normal source.

3.06 DATA LOGGING AND DIAGNOSTICS

Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual are not permissible.

A. Controller & Contactor Health Monitoring with visual and auxiliary contact status shall be provided.

B. Communications Interface – The controller shall be capable of interfacing, through a standard RS-485 serial communication port with a network of transfer switches.

C. Data Logging – The controller shall have the ability to log data and to maintain the last 200 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
   1. Date, time and reason for transfer normal to emergency.
   2. Date, time and reason for transfer emergency to normal.
   3. Date, time and reason for engine start.
   4. Date and time engine stopped.
   5. Date and time emergency source available.
   6. Date and time emergency source not available.

PART 4 - ADDITIONAL FEATURES AND ACCESSORIES

4.01 ADDITIONAL OPTIONAL FEATURES

A. Line Interrupt Time Delay. - Not Selected

B. Integrating Metering with current transformer. - Not Selected

C. Manual Retransfer to Generator. - Not Selected

D. Permissive (Emergency Inhibit). - Not Selected

E. Chicago Toolkit. - Not Selected

F. Expanded Input/Output Module. - Not Selected

G. Pad Lockable Control. - Not Selected

H. Temperature and Humidity Controlled Heater for NEMA1. - Not Selected

I. Transient Voltage Surge Suppressor (TVSS). - Not Selected

PART 5 - ADDITIONAL REQUIREMENTS

5.01 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. The basis of design for this project is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch with a 100ka 3 Cycle Rating, 100ka (.05 seconds) Time Based Rating, and a 125ka Specific Breaker Rating transfer switches from other manufacturers with ratings less than provided in this section will need to be approved by the Consulting Engineer to ensure compatibility with the project.

B. Provide a temperature and humidity controlled anti-condensation heater for all NEMA 3R and 4X enclosed units. Heater shall be an available option on NEMA 1 enclosures, when called for on plans. Heater cover to indicate a hot surface.

C. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.

D. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

5.02 TESTS AND CERTIFICATION

A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.

B. The ATS manufacturer shall be certified to ISO 9001: 2015 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation, and servicing in accordance with ISO 9001: 2015.

5.03 SERVICE REPRESENTATION

A. The ATS manufacturer shall support a service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of switch shipments, by serial number, for a minimum of 10 years.

5.04 WARRANTY

A. The basis of design is a Generac TX Series Non-Service Entrance Rated Automatic Transfer Switch Basic 2 Year Warranty.

B. A Basic Warranty is defined as the manufacturer covering replacement parts for the listed amount of the warranty period.

C. The Comprehensive Warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for covered warranty repairs during the listed warranty period.

D. The switch mechanism and controller shall be easily removable from the enclosure in the field. This requirement will facilitate easy single-person installation on wall mounted switches, conduit fitting, and cable pulling while minimizing risk of damage and/or contamination of ATS components during the installation process.

E. Controller human interface and USB port shall be visible and operational through the enclosure door, without the need for personal protective equipment, avoiding arc-flash hazard for routine checks of the controller status.

END OF SECTION 26 36 23