



March 3, 2026

To All Bidders:

Subject: **Bid No. 8640-J6 – Generator Replacement – Mckeon Rd. Fire Station / WFD**

**ADDENDUM NO. 3**

To Whom It May Concern:

With reference to our bid request relative to the above subject, please refer to the changes/modifications/clarifications to the original proposal request.

**ITEM 1: CHANGES/CLARIFICATIONS TO DRAWINGS**

**1.1** Drawing No. E300:

Electrical One Line Diagram: Change 150kW/187.5kVA 208Y/120V, 3ph,4w natural gas generator to 150kW/187.5kVA, 208Y/120V diesel-fired generator.

**1.2** Drawing No. E301:

Electrical One Line Diagram Add Alternate: Change 150kW/187.5kVA 208Y/120V, 3ph,4w natural gas generator to 150kW/187.5kVA, 208Y/120V diesel-fired generator.

**ITEM 2: CHANGES/CLARIFICATIONS TO SPECIFICATIONS**

**2.1** Section 263214:

Please replace in its entirety with Section 263213 (which is attached).

**Attachments:**

Drawing E300 and E301  
Specification Section 263213

Bidders are requested to acknowledge and/or include this addendum with submission. All other terms, conditions and specifications remain unchanged.

Very truly yours,

Jerry Kucera  
Buyer

STAMP  
**PRELIMINARY  
 NOT FOR  
 CONSTRUCTION**

**PROJECT  
 STATUS  
 DATE**

THE PROFESSIONAL ENGINEER SEAL AFFIXED TO THIS SHEET APPLIES ONLY TO THE MATERIAL AND WORK SHOWN ON THIS SHEET. ALL CHANGES, NOTICES AND OTHER DOCUMENTS NOT EXHIBITED WITH THIS SEAL SHALL NOT BE CONSIDERED PREPARED BY THIS ENGINEER, AND THIS ENGINEER EXPRESSLY DISCLAIMS ANY AND ALL RESPONSIBILITY FOR SUCH PLANS, DRAWINGS OR DOCUMENTS NOT EXHIBITED WITH THIS SEAL.

CLIENT

CONSULTANT

PROJECT NAME  
**WORCESTER FIRE DEPARTMENT  
 WORCESTER  
 MCKEON ROAD FIRE  
 STATION  
 GENERATOR  
 UPGRADE**

80 MCKEON RD,  
 WORCESTER, MA 01607

KEY PLAN

REVISION/ISSUANCE		
#	DESCRIPTION	DATE
1	ISSUED FOR BID	1/20/26
2	ADDENDUM 1	3/3/26

PROJECT NO.: 5940225-0003994  
 DESIGNED BY: MMW  
 CHECKED BY: KEG  
 DATE: 01.20.2026  
 SCALE: NTS

SHEET NAME  
**ELECTRICAL  
 ONE-LINE DIAGRAM  
 AND SCHEDULES**

SHEET NUMBER  
**E300**

EXISTING PANELBOARD SCHEDULE										
PANEL: MLP		VOLTS: 208Y120		MOUNT: SURFACE		GROUND BUS: Y				
MAIN: MLO		AMPS: 600		AIC: 10,000		ISOLATED GROUND BUS: N				
		PH/WIRE: 3/4		LOC:		200% NEUTRAL: N				
CIR.	AMPS/POLES	DESCRIPTION OF LOAD	LOAD KVA	LOAD BY PHASE, KVA			LOAD KVA	DESCRIPTION OF LOAD	AMPS/POLES	CIR.
				A	B	C				
1			7.68	13.38			5.70	PANEL PP	60/3	2
3	100/3	PANEL LP1	7.68		13.38		5.70			4
5			7.68				5.70			6
7		SPACE		2.29			2.29			8
9		SPACE			2.29		2.29	HU-1	30/3	10
11		SPACE				2.29	2.29			12
13	20/1	GENERATOR OUTLET	1.52	3.48			1.96	DRYER	30/2	14
15		SPACE			1.96		1.96			16
17			2.29			3.81	1.52	OUTLET	20/1	18
19	30/3	AH-1	2.29	2.29				SPACE		20
21			2.29					SPACE		22
23	20/1	GENERATOR OUTLET	1.52			1.52		SPACE		24
25		SPACE		0.00				SPACE		26
27		SPACE			0.00			SPACE		28
29		SPACE				0.00		SPACE		30
31			7.68	7.68				SPACE		32
33	100/3	AC CONDENSOR	7.68		7.68			SPACE		34
35			7.68			7.68		SPACE		36
37			7.68					SPACE		38
39	??/3	PANEL LP		0.00				SPACE		40
41					0.00			SPACE		42
43				0.00				SPACE		44
45	??/3	PANEL LP2			0.00			SPACE		46
47						0.00		SPACE		48
CONNECTED KVA BY PHASE -				29.12	27.60	28.68		TOTAL CONNECTED KVA-	85.40	
								DEMAND FACTOR	1.00	
								TOTAL DEMAND KVA-	85.40	
								TOTAL DEMAND AMPERES-	237.05	

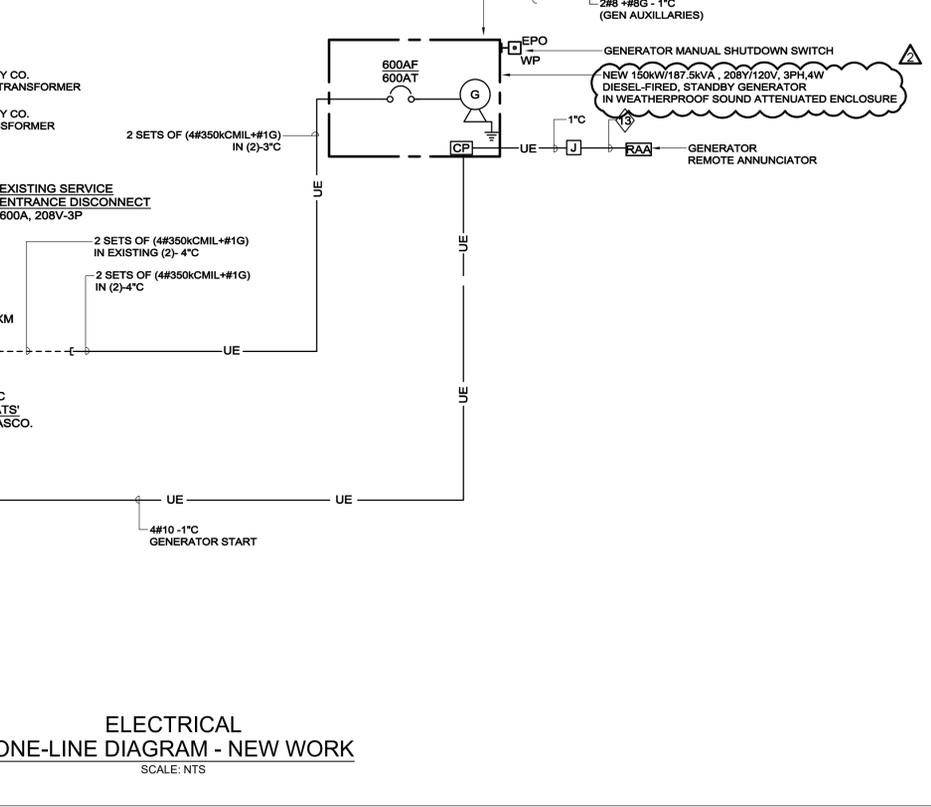
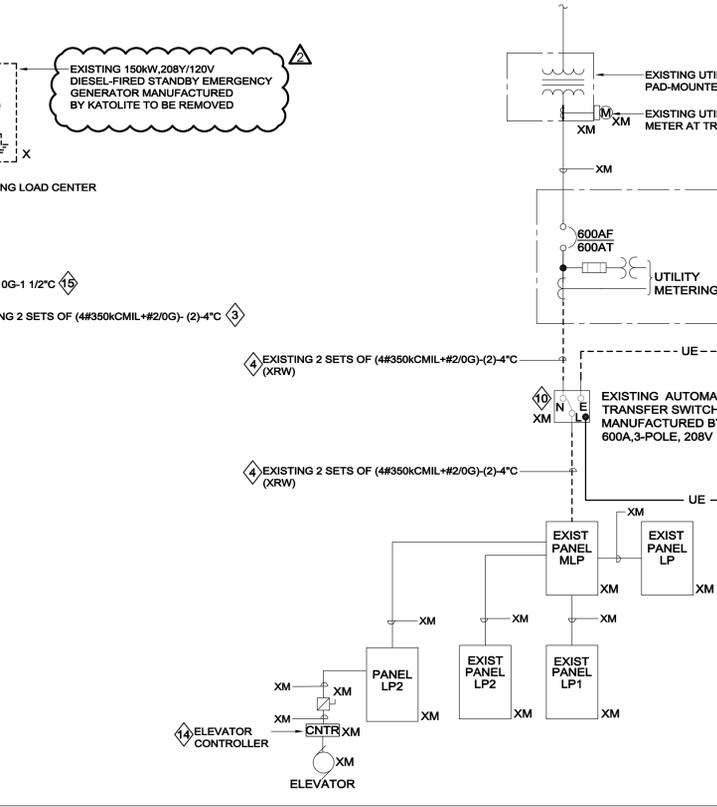
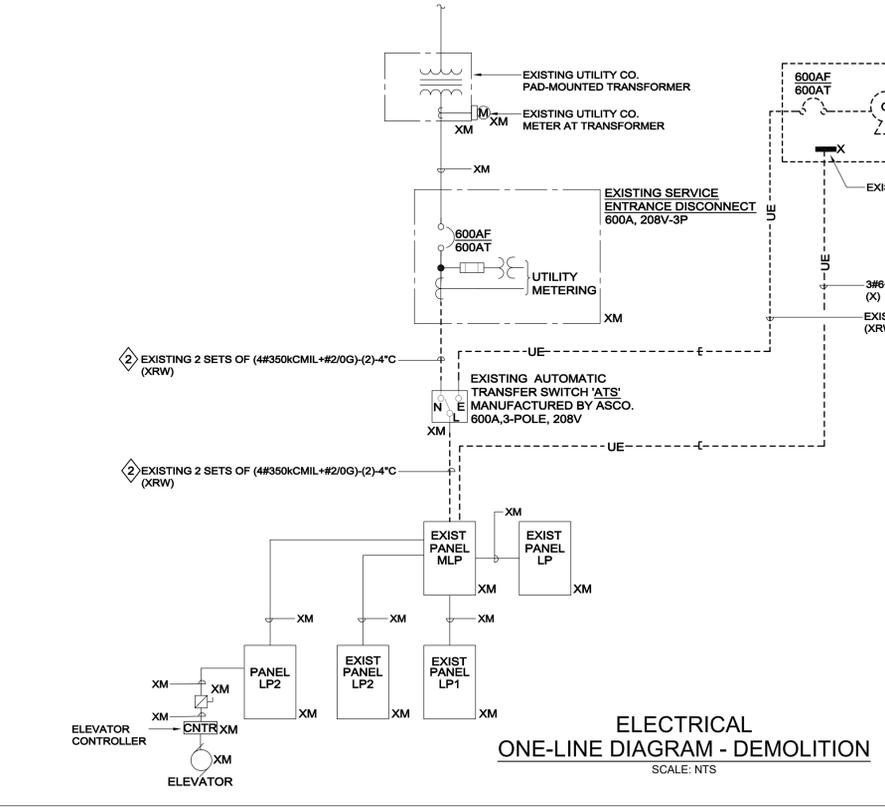
REVISED PANELBOARD SCHEDULE										
PANEL: MLP		VOLTS: 208Y120		MOUNT: SURFACE		GROUND BUS: Y				
MAIN: MLO		AMPS: 600		AIC: 10,000		ISOLATED GROUND BUS: N				
		PH/WIRE: 3/4		LOC:		200% NEUTRAL: N				
CIR.	AMPS/POLES	DESCRIPTION OF LOAD	LOAD KVA	LOAD BY PHASE, KVA			LOAD KVA	DESCRIPTION OF LOAD	AMPS/POLES	CIR.
				A	B	C				
1			7.68	13.38			5.70	PANEL PP	60/3	2
3	100/3	PANEL LP1	7.68		13.38		5.70			4
5			7.68				5.70			6
7	20/2	BATTERY CHARGER	1.00	3.29			2.29	HU-1	30/3	10
9			1.00		3.29		2.29			12
11	20/1	ENGINE BLOCK HEATER	1.50			3.79	2.29			14
13	20/1	GENERATOR OUTLET	1.52	3.48			1.96	DRYER	30/2	16
15	20/1	ENGINE BLOCK HEATER	1.50			3.46	1.96			18
17			2.29			3.81	1.52	OUTLET	20/1	20
19	30/3	AH-1	2.29	2.29				SPACE		22
21			2.29					SPACE		24
23	20/1	GENERATOR OUTLET	1.52			1.52		SPACE		26
25	20/2	BATTERY CHARGER	1.00	1.00				SPACE		28
27			1.00		1.00			SPACE		30
29		SPACE				0.00		SPACE		32
31			7.68	7.68				SPACE		34
33	100/3	AC CONDENSOR	7.68		7.68			SPACE		36
35			7.68			7.68		SPACE		38
37			7.68					SPACE		40
39	??/3	PANEL LP		0.00				SPACE		42
41					0.00			SPACE		44
43				0.00				SPACE		46
45	??/3	PANEL LP2			0.00			SPACE		48
47						0.00		SPACE		50
CONNECTED KVA BY PHASE -				31.12	31.10	30.18		TOTAL CONNECTED KVA-	92.40	
								DEMAND FACTOR	1.00	
								TOTAL DEMAND KVA-	92.40	
								TOTAL DEMAND AMPERES-	256.48	

POWER RISER KEYNOTES	
1	EXISTING CONNECTED LOAD IS BASED ON CIRCUIT BREAKER RATING AT 80% UNLESS OTHERWISE NOTED.
2	EXISTING FEEDERS SHALL BE DISCONNECTED, 'MADE SAFE' AND RETAINED FOR REUSE.
3	EXISTING FEEDERS SHALL BE DISCONNECTED/REMOVED. RELATED CONDUIT SHALL BE CUT BACK AND REWORKED. REFER TO SITE PLAN, DRAWING E100 FOR ADDITIONAL INFORMATION.
4	RECONNECT/EXTEND EXISTING FEEDER/CONDUIT TO NEW EQUIPMENT AS REQUIRED.
4	PROVIDE NEW CIRCUIT BREAKER AS ILLUSTRATED. CIRCUIT BREAKER TYPE AND AIC RATING SHALL MATCH EXISTING BREAKERS MANUFACTURED BY GE. PROVIDE TYPEWRITTEN UPDATED PANEL DIRECTORY AND RE-BALANCE LOADS TO WITHIN 10% PHASE TO PHASE UPON COMPLETION OF WORK.
5	PROVIDE SIGNAL FROM THE ATS TO THE ELEVATOR CONTROLLER THAT (1) THE ELEVATOR IS ON EMERGENCY POWER AND (2) THE ELEVATOR IS READY TO TRANSFER FROM EMERGENCY TO NORMAL POWER. INTERCONNECT THE ATS AND THE ELEVATOR CONTROLLER WITH 4#10-1" C. ELEVATOR MAINTENANCE CONTRACTOR SHALL PROVIDE REPROGRAMMING OF ELEVATOR CONTROLLER.
6	PROVIDE OVERCURRENT PROTECTION DEVICES WITH THE CHARACTERISTICS DEFINED (FRAME SIZE, TRIP TYPE, ETC.). THE SPECIFIED SHORT CIRCUIT ANALYSIS SHALL BE PERFORMED ON THE ENTIRE SYSTEM WITH BOTH THE UTILITY AND THE GENERATOR SERVING AS THE POWER SOURCE.
7	NOT USED
8	NOT USED
9	PROVIDE NEW CIRCUIT BREAKER AS ILLUSTRATED. CIRCUIT BREAKER TYPE AND AIC RATING SHALL MATCH EXISTING BREAKERS MANUFACTURED BY GE. PROVIDE TYPEWRITTEN UPDATED PANEL DIRECTORY AND RE-BALANCE LOADS TO WITHIN 10% PHASE TO PHASE UPON COMPLETION OF WORK.
10	START CIRCUIT INTEGRITY MONITORING SHALL BE TESTED ON-SITE TO ENSURE PROPER OPERATION OF THE GENERATOR AND ANNUNCIATION ON THE LOCAL AND REMOTE ANNUNCIATOR BEFORE FINAL ACCEPTANCE OF THE SYSTEM.
11	NOT USED.
12	NOT USED.
13	PROVIDE WIRING IN ACCORDANCE WITH GENERATOR MANUFACTURER'S RECOMMENDATIONS.
14	PROVIDE TIME DELAY PRE-SIGNAL FROM THE ATS TO THE ELEVATOR CONTROLLER TO DELAY ELEVATOR START UTILIZING THE LOAD DISCONNECT FEATURE IN THE ATS CONTROLLER. PROVIDE 4#10-1" C FROM ATS TO THE ELEVATOR CONTROLLER LOCATED AT THE 2ND FLOOR.
15	EXISTING FEEDER SHALL BE DISCONNECTED/REMOVED BACK TO SOURCE. RELATED CONDUIT SHALL BE ABANDONED IN PLACE.

NOTES:  
 1 REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

POWER ONE-LINE DIAGRAM NOTES:

- REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES THAT MAY PERTAIN TO THIS DRAWING.
- THIS DRAWING IS INTENDED TO ILLUSTRATE MAJOR EQUIPMENT AND REQUIRED INTERCONNECTIONS. REFER TO THE FLOOR PLANS FOR EXACT LOCATIONS AND THE SPECIFICATIONS FOR ADDITIONAL INSTALLATION REQUIREMENTS. REFER TO PANELBOARD SCHEDULES THIS DRAWING FOR ADDITIONAL INFORMATION.
- ALL SEPARATELY DERIVED SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF ARTICLE 250 OF THE NEC. BOND ALL ELECTRICALLY CONDUCTIVE MATERIALS SUCH AS METAL PIPING SYSTEMS AND STRUCTURAL STEEL TO THE GROUNDING SYSTEM. REFER TO DETAILS FOR ADDITIONAL INFORMATION.
- GENERATOR MANUAL SHUT-DOWN STATION PUSHBUTTON LOCATED ON EXTERIOR OF GENERATOR ENCLOSURE SHALL BE WIRED IN SERIES WITH EPO ON GCP AND BE CAPABLE TO BE LOCKABLE IN THE OPEN POSITION PER MEC 445.18(B) AND TO MEET REQUIREMENTS OF MEC 225.31 & 225.32 ("IN SIGHT FROM").
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- EXTEND ALL RACEWAYS WITH LFMC TO GENERATOR ENCLOSURE CABINETS TO PROVIDE A COMPLETE RACEWAY SYSTEM.
- THE EMERGENCY DISTRIBUTION SYSTEM UPGRADES ARE A 'REPLACEMENT IN KIND' OF THE EXISTING SYSTEM. THE INSTALLATION DOES NOT CREATE A CODE VIOLATION OR INCREASE THE MAGNITUDE OF AN EXISTING VIOLATION IN ACCORDANCE WITH MASSACHUSETTS ELECTRIC CODE (AMENDMENTS) 527CMR 12.00 RULE 3.



W:\BUD3\Projects\2025\25-0003994 - Worcester Mckean Rd FS Generator\00 Drawings\00\_Vol\25-0003994\_E300 ELECTRICAL ONE-LINE DIAGRAM SCHEDULES AND DETAILS.dwg [3/30] March 3, 2026 - 1:57 PM merlin.micrometel

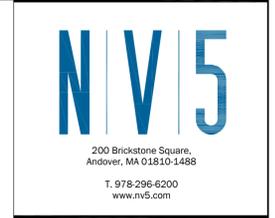
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								DEMAND FACTOR	1.00	
								TOTAL DEMAND KVA	92.40	
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POWER RISER KEYNOTES	
1	EXISTING CONNECTED LOAD IS BASED ON CIRCUIT BREAKER RATING AT 80% UNLESS OTHERWISE NOTED.
2	EXISTING FEEDERS SHALL BE DISCONNECTED, 'MADE SAFE' AND RETAINED FOR REUSE.
3	EXISTING FEEDERS SHALL BE DISCONNECTED/REMOVED. RELATED CONDUIT SHALL BE CUT BACK AND REWORKED. REFER TO SITE PLAN, DRAWING E100 FOR ADDITIONAL INFORMATION.
4	RECONNECT/EXTEND EXISTING FEEDER/CONDUIT TO NEW EQUIPMENT AS REQUIRED.
4	PROVIDE NEW CIRCUIT BREAKER AS ILLUSTRATED. CIRCUIT BREAKER TYPE AND AIC RATING SHALL MATCH EXISTING BREAKERS MANUFACTURED BY GE. PROVIDE TYPEWRITTEN UPDATED PANEL DIRECTORY AND RE-BALANCE LOADS TO WITHIN 10% PHASE TO PHASE UPON COMPLETION OF WORK.
5	PROVIDE SIGNAL FROM THE ATS TO THE ELEVATOR CONTROLLER THAT (1) THE ELEVATOR IS ON EMERGENCY POWER AND (2) THE ELEVATOR IS READY TO TRANSFER FROM EMERGENCY TO NORMAL POWER. ATS SHALL BE PROVIDED WITH THE (2) REQUIRED AUXILIARY CONTACTS. INTERCONNECT THE ATS AND THE ELEVATOR CONTROLLER WITH 4#10-1/2" C. ELEVATOR MAINTENANCE CONTRACTOR SHALL PROVIDE REPROGRAMMING OF ELEVATOR CONTROLLER AS REQUIRED FOR INSTALLATION OF NEW AUTOMATIC TRANSFER SWITCH.
6	PROVIDE OVERCURRENT PROTECTION DEVICES WITH THE CHARACTERISTICS DEFINED (FRAME SIZE, TRIP TYPE, ETC.), THE SPECIFIED SHORT CIRCUIT ANALYSIS SHALL BE PERFORMED ON THE ENTIRE SYSTEM WITH BOTH THE UTILITY AND THE GENERATOR SERVING AS THE POWER SOURCE.
7	TRYSSTAR MODEL #GDS SERIES OR EQUAL - 600A, 208Y/120V-3PH-4W-65KAIC RATED WITH PHASE ROTATION, PADLOCKABLE STAINLESS STEEL NEMA 4X HOUSING AND THE FOLLOWING OPTIONS: 1. TWO-WIRE GENERATOR AUTO START. 2. BATTERY CHARGER RECEPTACLE - 250V-20A-L6-20R. 3. ENGINE BLOCK HEATER RECEPTACLE - 125V-20A-L5-20 4. STRIP HEATER & THERMOSTAT. PHASE ROTATION AND BONDING REQUIREMENTS SHALL BE PERMANENTLY MARKED ON INTERIOR OF ENCLOSURE. PROVIDE WRITTEN SEQUENCE OF OPERATION FOR TEMPORARY GENERATOR TO BE POSTED IN EMERGENCY ELECTRIC ROOM AND ON THE INTERIOR OF THE TEMPORARY DOCKING STATION ENCLOSURE. TEMPORARY GENERATOR CONNECTION REQUIRED PER 2023 NEC ARTICLE 700.3(F). PROVIDE A PERMANENT LABEL THAT IDENTIFIES THE SYSTEM VOLTAGE, MAXIMUM AMPERAGE, SHORT CIRCUIT CURRENT RATING OF THE LOAD SIDE OF EQUIPMENT INSTALLED AND UNGROUNDED CONDUCTORS. IDENTIFICATION IN ACCORDANCE WITH 210.5, PER NEC ARTICLE 700.8(F)(7).
8	NON AUTOMATIC TRANSFER SWITCH IN WEATHERPROOF NEMA 4X STAINLESS STEEL SECURE ENCLOSURE AS MANUFACTURED BY ASCO MODEL # J-03MTS-B-3-0600-C-44G-170EP-V OR APPROVED EQUAL. PROVIDE WITH INTEGRAL STRIP HEATER AND CONNECTIVITY MODULE FOR REMOTE MONITORING. AS REQUIRED PER 2023 NEC ARTICLE 700.3(F)(5)
9	PROVIDE NEW CIRCUIT BREAKER AS ILLUSTRATED. CIRCUIT BREAKER TYPE AND AIC RATING SHALL MATCH EXISTING BREAKERS MANUFACTURED BY GE. PROVIDE TYPEWRITTEN UPDATED PANEL DIRECTORY AND RE-BALANCE LOADS TO WITHIN 10% PHASE TO PHASE UPON COMPLETION OF WORK.
10	START CIRCUIT INTEGRITY MONITORING AND TEMPORARY GENERATOR TRANSFER SWITCH STATUS MONITORING SHALL BE TESTED ON-SITE TO ENSURE PROPER OPERATION OF THE GENERATOR AND ANNUNCIATION ON THE LOCAL AND REMOTE ANNUNCIATORS BEFORE FINAL ACCEPTANCE OF THE SYSTEM.
11	MANUAL TRANSFER SWITCH REMOTE ANNUNCIATOR PANEL SHALL BE MANUFACTURED BY ASCO MODEL #5705 WITH #5161 CONNECTIVITY MODULE FOR ETHERNET TO RS485 CONVERSION. MONITORING REQUIRED PER 2023 NEC ARTICLE 700.3(F)(5).
12	PROVIDE BELDEN #2413 UTP ETHERNET CABLE AT END OF RUN FROM CONNECTIVITY MODULE TO EQUIPMENT/ANNUNCIATOR FOR RS485 TO ETHERNET CONVERSION.
13	PROVIDE WIRING IN ACCORDANCE WITH GENERATOR MANUFACTURER'S RECOMMENDATIONS.
14	PROVIDE TIME DELAY PRE-SIGNAL FROM THE ATS TO THE ELEVATOR CONTROLLER TO DELAY ELEVATOR START UTILIZING THE LOAD DISCONNECT FEATURE IN THE ATS CONTROLLER. PROVIDE 4#10-1" C FROM ATS TO THE ELEVATOR CONTROLLER LOCATED AT THE 2ND FLOOR.
15	EXISTING FEEDER SHALL BE DISCONNECTED/REMOVED BACK TO SOURCE. RELATED CONDUIT SHALL BE ABANDONED IN PLACE.
NOTES: 1 REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.	

POWER ONE-LINE DIAGRAM NOTES:	
1.	REFER TO DRAWING E000 FOR LEGEND, SYMBOLS AND GENERAL NOTES THAT MAY PERTAIN TO THIS DRAWING.
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3.	ALL SEPARATELY DERIVED SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF ARTICLE 250 OF THE NEC. BOND ALL ELECTRICALLY CONDUCTIVE MATERIALS SUCH AS METAL PIPING SYSTEMS AND STRUCTURAL STEEL TO THE GROUNDING SYSTEM. REFER TO DETAILS FOR ADDITIONAL INFORMATION.
4.	GENERATOR MANUAL SHUT-DOWN STATION PUSHBUTTON LOCATED ON EXTERIOR OF GENERATOR ENCLOSURE SHALL BE WIRED IN SERIES WITH EPO ON GCP AND BE CAPABLE TO BE LOCKABLE IN THE OPEN POSITION PER MEC 445.18(B) AND TO MEET REQUIREMENTS OF MEC 225.31 & 225.32 ("IN SIGHT FROM").
5.	PANELBOARDS SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVING, OR MAINTENANCE OF THE EQUIPMENT.
6.	EXTEND ALL RACEWAYS WITH LFMC TO GENERATOR ENCLOSURE CABINETS TO PROVIDE A COMPLETE RACEWAY SYSTEM.
7.	THE EMERGENCY DISTRIBUTION SYSTEM UPGRADES ARE A 'REPLACEMENT IN KIND' OF THE EXISTING SYSTEM. THE INSTALLATION DOES NOT CREATE A CODE VIOLATION OR INCREASE THE MAGNITUDE OF AN EXISTING VIOLATION IN ACCORDANCE WITH MASSACHUSETTS ELECTRIC CODE (AMENDMENTS) 527CMR 12.00 RULE 3.

KEYNOTES	
16	NEW AUTOMATIC TRANSFER SWITCH - SCOPE OF WORK SHALL BE CARRIED UNDER ADD ALTERNATE #1.
17	NEW PORTABLE GENERATOR DOCKING STATION - SCOPE OF WORK SHALL BE CARRIED UNDER ADD ALTERNATE #2.
NOTES: 1 REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.	



STAMP  
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CONSTRUCTION**

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80 MCKEON RD,  
WORCESTER, MA 01607

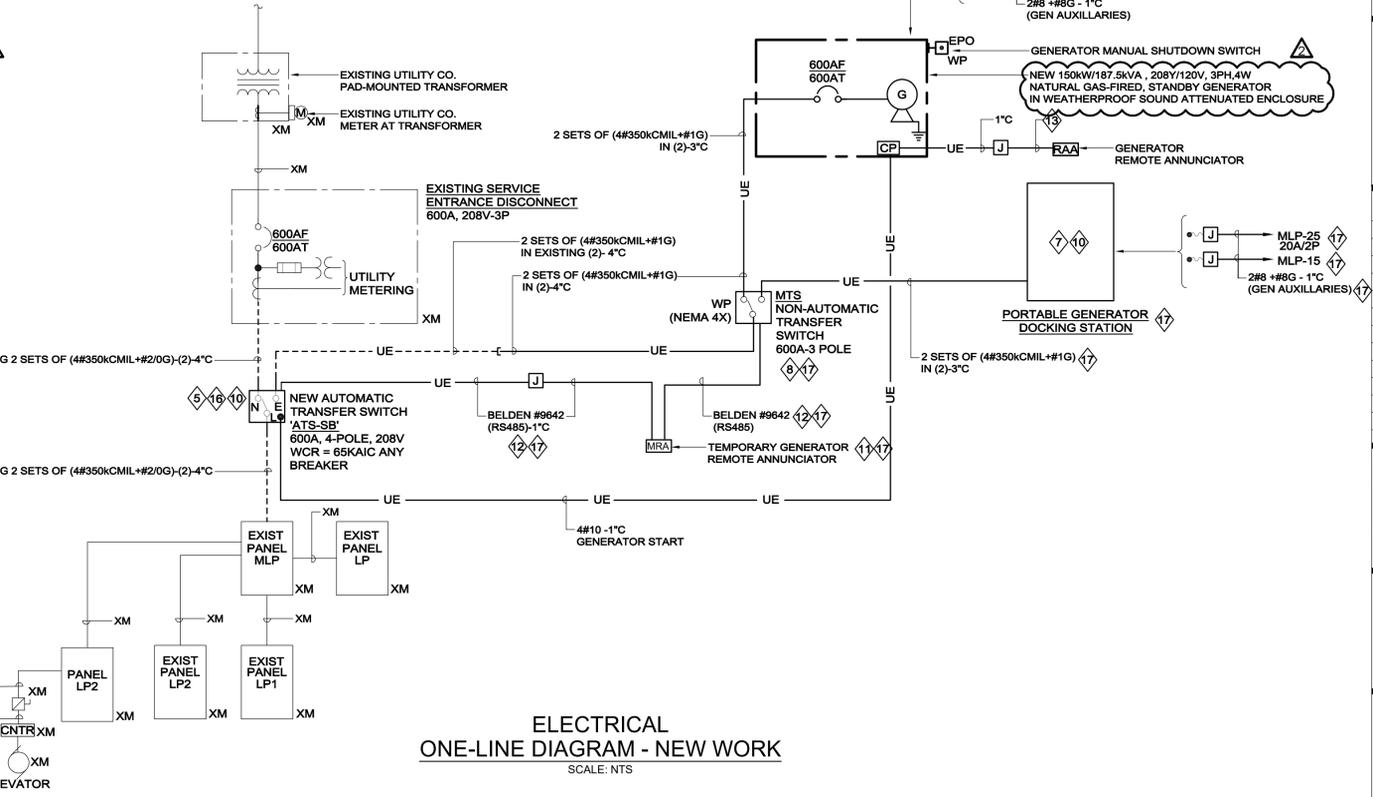
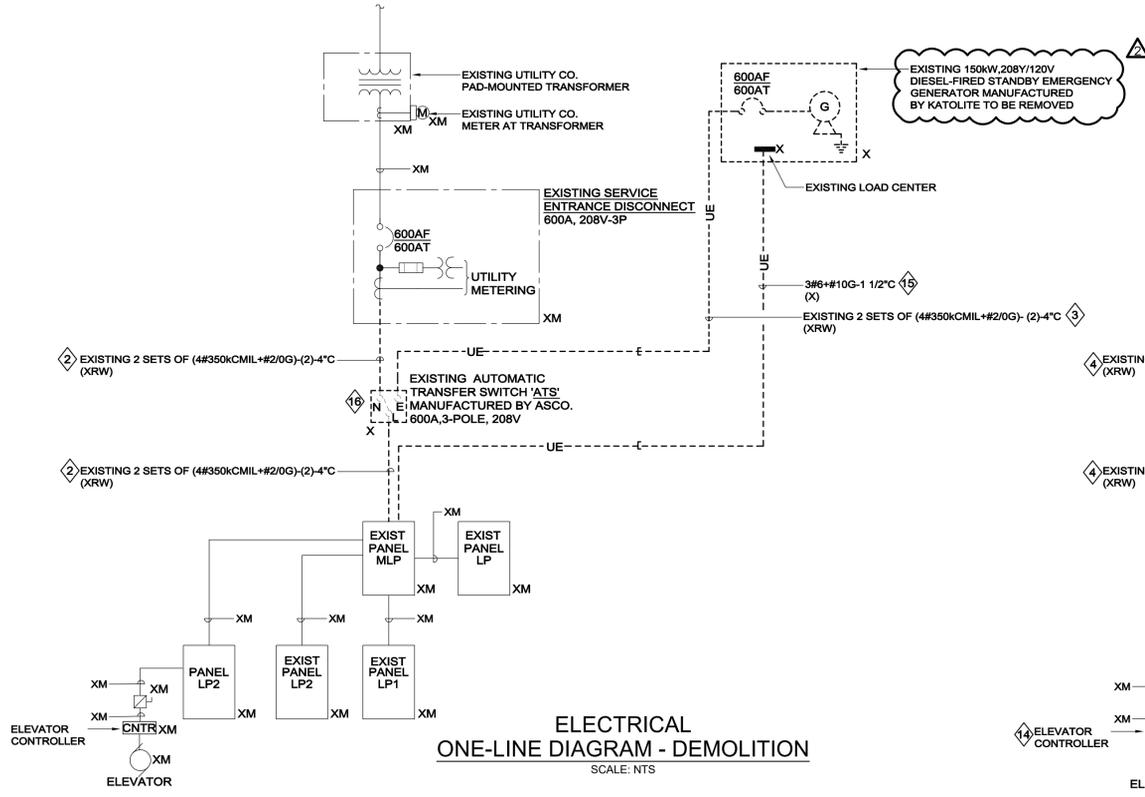
KEY PLAN

REVISION/ISSUANCE		
#	DESCRIPTION	DATE
1	ISSUED FOR BID	1/20/26
2	ADDENDUM 1	3/3/26

PROJECT NO.:	544025-0003994
DESIGNED BY:	MMW
CHECKED BY:	KEG
DATE:	01.20.2026
SCALE:	NTS

SHEET NAME  
**ELECTRICAL  
ONE-LINE DIAGRAM  
& SCHEDULES  
ADD ALTERNATES**

SHEET NUMBER  
**E301**



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## SECTION 26 32 13

### GENERATOR - DIESEL

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. All criteria establish within Specification 26 00 00 shall apply to this section unless specifically noted otherwise.

##### 1.2 SUMMARY

- A. Section includes packaged engine-generator sets for **[emergency]** **[and]** **[standby]** power supply with the following features:
  - 1. Fuel system day tank.
  - 2. Parallel generator sets.
  - 3. Load banks.
  - 4. Outdoor enclosure
  - 5. Acceptance Testing
- B. Related Sections include the following:
  - 1. Division 26 00 00 Electrical.
  - 2. Section 26 36 00 Transfer Switches for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.
  - 3. Section 26 23 13 Paralleling Low-Voltage Switchgear for controls and paralleling equipment for large or multiple parallel engine generators.
- C. Engine driven electrical generating systems shall be as manufactured by
  - 1. Caterpillar
  - 2. Cummins
  - 3. Kohler
- D. Obtain packaged generator sets and all associated auxiliary components through one source from a single manufacturer. Walk-in enclosures may deviate from this requirement.

##### 1.3 DEFINITIONS

- A. EPS: Emergency power supply.
- B. EPSS: Emergency power supply system

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#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each required component provide manufacturer's standard cut sheet containing technical details, listings and general information illustrating compliance with these specification requirements.
- B. Provide the following detailed documentation for review and evaluation:
  - 1. The manufacturer shall provide copies of following documents for review and evaluation in accordance with general requirements of Division 01 and Division 26:
    - a. Factory published specification sheet indicating standard and optional accessories, ratings, etc. Weights of all equipment shall be highlighted.
    - b. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, silencer, exhaust flex, main circuit breaker, etc.
    - c. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems shall be included.
    - d. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, etc. Air flow requirements shall be for cooling and combustion air in CFM at 0.8 power factor, with air supply temperature of 95, 80, 70, and 50 °F.
    - e. Fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
    - f. Generator electrical data including resistances, reactances, time constants, temperature and insulation data, thermal damage curve, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
    - g. Certified trip curves for each circuit breaker.
    - h. Certified copies of all Type (Design) and Verification Test Reports for prototype units.
    - i. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, and remote alarm indications.
    - j. Control panel schematics.
    - k. Calculations indicating acceptable performance of the submitted unit starting and running the specified load.
  - 2. Report of exhaust emissions showing compliance with applicable regulations.
  - 3. Third party certified noise test data on an equal or similar enclosure design.
  - 4. Manufacturers and dealers written warranty.
  - 5. Seismic Qualification Certificates for engine-generator set, accessories, and components.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submit test report confirming acceptance of all Installation inspections and tests as outlined in Part 3 of this specification.

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- B. Submit operation and maintenance data based on factory and field-testing, operation and maintenance of specified product.
- C. Submit maintenance manuals and recommended spare parts list required to conform to industry standard maintenance guidelines. Instructions shall include but not be limited to:
  - 1. Instructions for replacing any renewable components of the system.
  - 2. Instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.
  - 3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.

#### 1.6 QUALITY ASSURANCE

- A. The system design and installation shall conform to the following standards
  - 1. All equipment shall be UL listed for its intended purpose, including UL 2200.
  - 2. All applicable NFPA standards, including but not limited to: 70 and 110.
  - 3. State Building Code.
  - 4. All requirements of the Authority Having Jurisdiction (AHJ)
- B. The equipment supplier and the Contractor shall demonstrate a minimum five (5) years' experience in the successful design and installation of standby generation systems similar in size and scope to that required for this project.

#### 1.7 WARRANTY

- A. The installer and manufacturer's warranty shall be for a minimum period of five (5) years from the date of the final acceptance test approval.
- B. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five (5) calendar days.

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of actual equipment provided. Provide sketches to illustrate submitted equipment will fit within the allocated space where the dimensions of the submitted equipment exceed those illustrated on the drawings for the basis of design.

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL

- A. Provide factory assembled water cooled diesel engine-driven electric generating system rated for emergency standby service. The automatic transfer switch(es) specified in other sections of this specification shall be supplied by the generator set manufacturer in order

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to establish and maintain a single source of system responsibility and coordination. Refer to the drawings for service ratings at 60 Hz.

- B. The system shall automatically start and accept full rated load within ten (10) seconds of being signaled to start.
- C. Engine generator and accessories including control panel, engine starting batteries and output circuit breaker(s) shall be mounted within a sound attenuated weatherproof enclosure. Refer to the enclosure specification section for additional details.
- E. Specified kW is for continuous service during utility source interruption, as established in ISO 8528-3 at 86°F. Rating shall be substantiated by manufacturer's standard published curves. Special and maximum ratings will not be accepted.
- F. Supplier shall have been engaged regularly in generator or engine manufacture, or both, for at least twenty-five (25) years. The generator manufacturer and dealer shall be ISO 9001 certified.
- G. The supplier shall maintain a full time in-house parts and service organization so that parts and service are readily available, twenty-four (24) hours/day seven (7) days/week. Qualified, factory trained service personnel shall be available within four (4) hours of notification.
- H. Prototype testing shall certify the acceptable performance of the generating set series. The test shall prove acceptance, as a system, of the design and integration of all components. Proposed system shall be a current factory production model. Prototype testing shall confirm:
  - 1. Fuel consumption at  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and full load.
  - 2. Exhaust emissions.
  - 3. Mechanical and exhaust noise levels.
  - 4. Governor speed regulation at  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and full load.
  - 5. Generator temperature rise in accordance with NEMA MG1-22.40
  - 6. Harmonic analysis, voltage waveform deviation and telephone influence factor.
  - 7. Generator short circuit capacity.
  - 8. Cooling system capacity.
- I. Provide manufacturer's load analysis calculation confirming that the generating set submitted is compatible with loads to be applied.
  - 1. Generator-Set Performance: Steady-State Voltage Operational Bandwidth: 3% of rated output voltage from no load to full load.
  - 2. Transient Voltage Performance: Not more than 20% variation for 50% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three (3) seconds.
  - 3. Steady-State Frequency Operational Bandwidth: 0.5% 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 5% variation for 50% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five (5) seconds.

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6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for single harmonics. Telephone influence factor, determined according to NEMA MG1, shall not exceed 50%.
  7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250% of rated full-load current for not less than ten (10) seconds and then clear the fault automatically, without damage to generator system components.
  8. Below requires ten (10) second maximum start time under specific conditions and includes startup only, not load assumption.
  9. Start Time: Comply with NFPA 110, Type 10, system requirements.
- J. The proposed generator set shall be EPA Tier Certified and in compliance with the Commonwealth of Massachusetts Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with EPA Tier emissions standards per ISO 8178 – D2 Emissions Cycle at specified EKW/BHP rating. Utilization of the “Transition Program for Equipment Manufacturers” also known as “Flex Credits” to achieve Tier certification is not in compliance with MA Regulation “310 CMR 7.02 U Plan Approval and Emission Limitations” and will not be accepted.
- K. The manufacturer’s warrantee shall be for a minimum period of five (5) years from the date of initial system start-up and acceptance or 1,500 operating hours, whichever occurs first. The warrantee shall include repair parts, expendables (lubricating oil, filters, antifreeze, etc.), labor and travel expenses necessary for repairs at the job site. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five (5) calendar days.

## 2.2 ENGINE

- A. The engine shall be diesel fueled, four (4) cycle, water-cooled, either vertical in-line or V-type, with dry exhaust manifolds, operating with nominal speed not exceeding 1800 RPM. It shall have 6 cylinders with a minimum cubic inch displacement of 7.0L(428in<sup>2</sup>).
- B. Frequency regulation shall be Isochronous, regulated to within +/- 0.25% from no load to full load.
- C. All fuel piping shall be black iron or flexible fuel hose rated for this service. Flexible fuel lines rated 300°F and 100 PSI.
- D. The engine shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions, 110°F ambient air entering the room or enclosure (where an enclosure is specified), and permanent anti-freeze solution of 5 ethylene-glycol-based antifreeze and water with anticorrosion additives as recommended by engine manufacturer to protect equipment to –15°F without derating the unit. Antifreeze shall have a service life of 3000 hours without maintenance. The generator set supplier is responsible for providing a properly sized cooling system based on the installed static pressure restriction.
- E. Provide thermostatically-controlled electric-immersion type engine jacket water heater, be sized by the manufacturer to maintain jacket water temperature at 90°F, 208 V, single-

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phase, 60 HZ mounted, piped and prewired to terminal strip.

- F. Lube oil pump shall be mechanically driven positive displacement. Lube oil system shall be piped through an oil cooler and a full flow filter with replaceable cartridge. Filter and Strainer shall be rated to remove 90% of particles 5 micrometers and smaller while passing full flow.
- G. Fuel oil pump shall be mechanically driven positive displacement with dual full flow filters and replaceable cartridge. One filter shall be isolated while the other is on-line. Fuel system shall have a manual-priming pump. Fuel piping shall be arranged to prohibit loss of prime with an anti-siphon check valve at the fuel pump suction piping. Filter and Strainer shall be rated to remove 90% of particles 5 micrometers and smaller while passing full flow.
- H. Air intake shall be via a heavy duty replaceable dry element filter and "blocked filter" indicator.
- I. Provide lubricating oil pressure gauge, water temperature gauge, battery charge rate ammeter and running time meter mounted in common panel with engine controls, alternator controls and alternator instruments.
- J. A critical type silencer (25-34 DBA at 500Hz exhaust noise reduction), companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. The muffler and all indoor exhaust piping shall be "lagged" by the Contractor to maintain a surface temperature not to exceed 150°F. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting.
- K. Packaged generator set shall be certified and in compliance with the latest Non-Road, Off-Highway EPA and CARB Emission regulations.

## 2.3 ALTERNATOR

- A. The synchronous generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling to ensure permanent alignment. The insulation material shall meet NEMA standards for Class H insulation and be impregnated in a polyester varnish or vacuum impregnated with epoxy varnish to be fungus resistant. Temperature rise of the rotor and stator shall not exceed NEMA class F (130 °C rise by resistance over 40°C ambient). Stator windings shall be random wound two-thirds pitch. Subtransient resistance shall not exceed 12%.
- B. The excitation system shall be of brushless construction. The permanent magnet brushless exciter shall be independent of main stator windings, shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes. Generator shall have the ability to sustain short circuit current for ten (10) seconds of 300% of rated current to allow protective devices to operate.

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- C. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be three phase sensing, totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, overexcitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed. System shall reduce voltage automatically if load demand exceeds engine capacity and remove excitation when generator is overloaded for more than ten (10) seconds. Voltage regulator shall be, volts-per-hertz and include over voltage and under voltage protection.
1. Maintain voltage within 20% on one step, full load
  2. Maintain frequency within 10% and stabilize at rated frequency within two (2) seconds.
- D. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for sixty (60) seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
  2. Under single or three-phase fault conditions, regulates generator to 300% of rated full-load current for up to ten (10) seconds.
  3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
  4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- E. The alternator output shall be wired via a generator mounted 3 pole molded case circuit breaker, trip rating as indicated on the drawings. Breaker shall utilize an electronic LSI solid state trip. Unit breaker shall each be housed in a steel NEMA 1 enclosure mounted on a separate support stand vibration isolated from the engine / generator arrangement. Each separate branch (NEC 700, 701 702 and Fire Pump) shall be in its own separate enclosure. Refer to the one line diagram for branches required. Bus bars, sized for the cable type shown on drawing, shall be supplied on the load side of breaker.

## 2.4 VIBRATION ISOLATION

- A. Provide spring vibration mounts between engine generator set and structural sub-base as recommended by equipment manufacturer. Unit shall be suitable for installation on any level surface.

## 2.5 DAY TANK

- A. The day tank system shall be supplied by the engine generator set supplier and shall include the following:

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1. Tank sized for a usable capacity of an uninterrupted period of four (4) hours of operation at 100% of rated power output of engine-generator system without being refilled; pressure tested, double walled, U/L Listed.
2. Transfer pump sized greater than the maximum fuel draw of the engine rated fuel consumption at 110% rated capacity output capacity.
3. Rupture basin alarm contact.
4. Low level alarm contact at 25% capacity.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100% of normal fuel level.
6. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor control device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator set.
7. Float controls.
8. Fuel gauge, dial type.
9. Piping connections for:
  - a. Engine supply.
  - b. Engine return.
  - c. Vent with vent whistle.
  - d. Bottom drain.
  - e. Fuel gauge.
  - f. Manual fill cap, lockable.

## 2.6 STARTING

- A. A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.
- B. Provide 24 V lead acid batteries as recommended by equipment manufacturer, sized to provide no less than three cranking cycles without recharging. Provide unit mounted battery rack fabricated of metal with acid-resistant finish and thermal insulation, hold down and battery cables.
- C. A current limiting automatic-equalizing and float battery charger shall be furnished to recharge batteries. Unit shall comply with UL 1236 and include the following features:
  1. Equalizing-charging rate of 10 amps shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
  2. Adjust float and equalize voltages for variations in ambient temperature from minus 40 °F to 140 °F to prevent overcharging at high temperatures and undercharging at low temperatures.
  3. Maintain constant output voltage regardless of input voltage variations up to plus or minus 10%.
  4. Ammeter and Voltmeter shall be flush mounted in door. Meters shall indicate charging rates.
  5. Sense abnormally low battery voltage and close contacts providing low battery

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voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

6. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.
- D. Provide battery blanket heater to maintain battery temperature between 50°F and 90°F.

## 2.7 CONTROL PANEL

- A. Provide a generator set mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation, cycle cranking, AC metering (0.5% true RMS accuracy) with phase selector switch, shutdown sensors and alarms with horn and reset, adjustable cool-down timer and emergency stop push-button and engine run time meter (non-resettable).
- B. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 1/IP22 enclosure with hinged door.
- C. The panel itself shall be mounted on a separate support stand isolated from the engine / generator arrangement. Panel / breaker arrangements mounted on the generator set in such a way that access to the AC Generator terminal box is restricted in any way whatsoever are not acceptable.
- D. Provide the following readouts:
  1. Engine oil pressure
  2. Coolant temperature
  3. Engine RPM
  4. System DC Volts
  5. Engine running hours
  6. Generator AC volts
  7. Generator frequency
  8. Generator AC amps
- E. Provide the following indications for protection and diagnostics according to NFPA 110 Level 1:
  1. Low oil pressure
  2. High water temperature
  3. Low coolant level
  4. Overspeed
  5. Overcrank
  6. Emergency stop depressed
  7. Approaching high coolant temperature
  8. Approaching low oil pressure
  9. Low coolant temperature
  10. Low voltage in battery
  11. Control switch not in auto position
  12. Low fuel main tank
  13. Battery charger AC failure

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14. High battery voltage
  15. Fuel tank rupture
  16. Engine running
- F. Diagnostics capabilities shall identify both system and component level issues. The diagnostic codes shall be maintained in a history log specifying the number of occurrences, and second/minute/hr at which they occur.
- G. Provide the following control functions:
1. Terminals located inside the control panel for REMOTE EMERGENCY STOP
  2. ON / OFF / AUTO control switch
- H. Provide a minimum of four (4) programmable output dry contacts for connection to the Owner's security or ATC system. Three (3) of the four (4) outputs shall be programmed to alarm "Engine Running", "Summary Alarm" and "Generator not in Automatic".

## 2.8 ANNUNCIATOR

- A. Provide an annunciator to meet the requirements of NFPA 110, Level 1, installed in enclosure suitable for surface mounting. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.

## 2.9 I/O MODULE

- A. Provide two (2) eight-point remote I/O modules for redundant monitoring of NFPA110, Level 1 alarms by the Owner's security or ATC system. The remote I/O modules shall interconnect with the ECP on the remote annunciator network wiring and be located in the building adjacent to the Owner's data collection panel.

## 2.10 SOUND ATTENUATED WEATHERPROOF ENCLOSURE.

- A. Engine generator set, generator control panel, engine starting batteries and internally mounted exhaust silencer shall be enclosed in factory-assembled, rainproof-weather-protective skid-base enclosure with full floor panel. The enclosure shall have a resulting sound level of less than 71 DBA at fifty (50) feet. The enclosure and generator shall be UL2200 labeled.
- B. Enclosure will consist of a roof, fuel tank and rupture basin base, two (2) side walls, and two (2) end walls, of highly corrosion resistant construction made from galvanized steel. Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion. The sheet steel components shall be pre-tested with zinc phosphate prior to polyester powder coating at 392 °F. Roof bows shall be cambered to aid in rain runoff.
- C. An integral fuel tank underframe and rupture basin shall be supplied, consisting of the following:
1. A rupture basin utilizing minimum 7 gauge steel channel perimeter walls and

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- bottom.
  2. A U.L. listed (per U.L. 142) above-ground 600 gallon capacity rectangular tank of minimum 12 gauge steel construction.
  3. The tank shall have venting and emergency venting (to roof) per U.L. 142, lockable fill, low level and high level alarm contacts, and an electric analog level gauge.
  4. The fill valve shall have an overfill prevention type, equal to the "Stopper" OPW 61f stop.
  5. The rupture basin shall have a float contact to indicate tank rupture.
  6. The entire system shall be leak tested prior to installation.
- D. Intake openings shall be screened to prevent the entrance of rodents. The system shall include a cooling and combustion air inlet silencer system, an equipment enclosure section, and a cooling air discharge silencer section.
- E. Number of doors on enclosure shall be as required so that all normal maintenance operations, such as lube oil change, filter change, belt adjustment and replacements, hose replacements, access to the control panels, etc., may be accomplished without disassembly of any enclosure components. Access doors shall be fabricated of the same material as the enclosure walls. They shall be reinforced for rigidity and set in a welded frame to ensure proper operation. Handles shall be key lockable, all doors keyed alike, and hinges shall be zinc die cast or stainless steel. Fasteners shall be zinc plated or stainless steel. Doors shall be of a lift off design allowing one person to remove door if necessary and/or top hung and supported by gas struts.
- F. Battery racks and batteries shall be factory-installed and wired. Exhaust silencer, flexible exhaust connector and condensate drain valve shall be factory-installed.
- G. Lube oil and coolant drains shall be extended to the exterior of the enclosure and terminated with drain valves and capped with pipe nipples on flanged connectors. Radiator access shall be through a hinged, lockable cover on enclosure. Cooling fan and charging alternator shall be fully guarded to prevent injury.
- H. Owner shall select finish color of enclosure.
- I. The exhaust stack shall be a minimum of 10 feet- 0 inches above the enclosure roof. All required supports shall be attached to the enclosure. No obstructions shall be allowed to the exhaust outlet.
- J. Provide a manual stop break-glass station to allow emergency shutdown of the unit. The station shall be integrated into the enclosure and accessible from the exterior, no greater than 6 feet-0 inches AFG.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Placement of the generator shall be the responsibility of the electrical Contractor. Coordinate placement with the Owner's Representative and obtain all associated permits

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and permissions necessary for blockage of public way, interference with parking, etc.

- B. Fill all fluid levels (including fuel where applicable) to maximum recommended levels by the manufacturer prior to testing and after testing completed.

### 3.2 START-UP AND TESTING

- A. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following four (4) hour load test:
  - 1. Verify that the equipment has been properly installed.
  - 2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, all remote annunciator points, etc.
  - 3. Test all alarms and safety shutdown devices for proper operation and annunciation.
  - 4. Check all fluid levels.
  - 5. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
  - 6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
  - 7. Connect the generator to building load and verify that the generator will start and run all designated loads. Testing shall be performed in accordance with NFPA 110 from a "cold start" condition. Each of the following shall be observed and recorded upon opening of the Normal supply circuit breaker to the ATS:
    - a. Time delay on start
    - b. Cranking time until the prime mover starts and runs
    - c. Time required to reach operating speed
    - d. Voltage and frequency overshoot
    - e. Time required to reach steady state conditions with all switches transferred to the emergency position
    - f. Voltage, frequency and current
  - 8. The system shall be tested under load for a period of two (2) hours. The following readings shall be taken at fifteen (15) minute intervals:
    - a. Oil pressure
    - b. Coolant temperature
    - c. Battery charge rate
    - d. AC volts
    - e. AC Amperes- all phases
    - f. Frequency
    - g. Kilowatts
    - h. Kilovolt-amperes
    - i. Ambient Temperature
  - 9. Allow system to cool for five (5) minutes.
  - 10. The system shall be tested for a period of two (2) hours with the use of a portable resistive/reactive loadbank at 100% rated load. Load shall be applied upon reaching rated RPM in one step. All data specified above shall be recorded for this segment until completion of the two-hour test.
  - 11. The Generator Distributor shall provide a written test report upon completion of testing. Report shall specifically indicate the successful completion of each item referenced above and submit all recordings in a format similar to NFPA 110

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tables.

- B. All costs associated with the referenced testing, including fuel consumption, load bank rental, temporary cables from the generator to the load bank, etc. shall be included in the bid price.

### 3.3 TRAINING

- A. Provide a one (1) day of on-site training to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION 26 32 13