

Proposed Electrical Riser Diagram

1 E6.01 N.T.S.

LIGHT LINES INDICATE EXISTING TO REMAIN. DARK LINES INDICATE PROPOSED WORK.

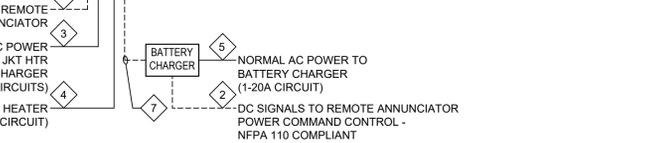
Riser Diagram Key Notes

- UTILIZE AN EXISTING SPARE 200A, 3P BREAKER TO FEED THE NEW ATS-2.
- REFEED EXISTING ATS. WHERE ADDITIONAL CONDUCTOR LENGTH IS REQUIRED TO MAKE THE NEW CONNECTION, INTERCEPT THE EXISTING FEEDER CIRCUIT AND INSTALL A NEW, CODE SIZED, JUNCTION BOX. COORDINATE WITH EXISTING FIELD CONDITIONS. REUSE EXISTING RACEWAY(S) TO THE FULLEST EXTENT PRACTICAL. INSTALL NEW CONDUCTORS AS REQUIRED.
- REFER TO GENERATOR REQUIREMENTS.
- PER NEC 702.7, CONTACTOR SHALL FURNISH AND INSTALL FIXED IDENTIFIER ON ALL PANELBOARDS INCLUDING THE MDP, TRANSFER SWITCH, GENERATOR, ETC. CONTAINING "OPTIONAL LOADS" TO READILY IDENTIFY THEM AS COMPONENTS OF A STANDBY GENERATOR. IDENTIFICATION LABELS SHALL BE WHITE LETTERING ON RED BACKGROUND. ALL IDENTIFICATION PLATE SHALL BE ENGRAVED WITH LETTERING HEIGHT 1/8" AND MUST BE SECURED WITH RIVETS. A PERMANENT SIGN MUST BE PLACED ON THE MDP BY THE CONTRACTOR INDICATING THE LOCATION OF THE ALTERNATE ON-SITE POWER SOURCE.
- UTILIZE AN EXISTING SPARE BREAKER TO FEED THE NEW PANEL.
- INSTALL A NEW ELECTRONIC TRIP BREAKER IN EXISTING SPACE. COORDINATE BREAKER WITH 200A STAGE DIMMING PANEL.
- NEW 2" C TO ACCOMMODATE EXTENSION OF DM-1.2.3.12.13.14 CIRCUITING. (DERATE #12 AWG BRANCH CIRCUIT CONDUCTORS TO COMPLY WITH NEC TABLE 310.15(B)(2)(a))

Riser Diagram Symbol Legend

- LOW VOLTAGE, CIRCUIT BREAKER
- "FRAME" INDICATES FRAME SIZE
- "TRIP" INDICATES DRIP AMPERAGE RATING
- CODE SIZED JUNCTION BOX TO FACILITATE FEEDER EXTENSION/RE-ROUTING AS REQUIRED.
- AUTOMATIC TRANSFER SWITCH - REFER TO "ATS REQUIREMENTS" SCHEDULE FOR ADDITIONAL INFORMATION.
- GENERATOR - REFER TO "GENERATOR REQUIREMENTS" SCHEDULE FOR ADDITIONAL INFORMATION.
- PANEL - REFER TO PANEL SCHEDULE FOR ADDITIONAL REQUIREMENTS.

ATS Grounding Detail



Generator Wiring Schematic

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Generator Wiring Schematic Key Notes (3/E6.01)

- DC START SIGNAL FROM TRANSFER SWITCH. 1/2" W (3) #12 & (1) #12 GND.
- DC POWER & CAT. 5E CABLE TO REMOTE ANNUNCIATOR. 1/2" W (2) #12 & 1/2" W (1) BELDEN CABLE MODEL 9729.
- 120VAC, (2) 20A, 1P BREAKERS & BRANCH CIRCUITS FOR EQUIPMENT LISTED.
- 120VAC, (1) 20A, 1P BREAKER & BRANCH CIRCUIT FOR EQUIPMENT LISTED.
- 120VAC, (1) 20A, 1P BREAKER & BRANCH CIRCUIT FOR EQUIPMENT LISTED.
- CIRCUIT FOR EQUIPMENT LISTED. CUMMINS GENERATOR FRAME.
- DC POWER TO BATTERY, (2) #6

General Notes:

- Installation shall conform to NECA/EGSA 404-200, "Recommended Practice for Installing Generator Sets".
- Refer to Manufacturer's published installation manual for specific wiring requirements. Size raceways as per NEC standards.

Generator General Notes

- The standby power distribution system shall consist of a central engine generator and a separate distribution system with automatic transfer switch(es), disconnect switch(es), distribution panel(s), and dry-type transformers feeding 208/120V stand by distribution panels as required.
- The authority having jurisdiction and the local utility company must approve all equipment, i.e., generator, transfer switch, etc. used for the stand by system. Electrical contractor is responsible to coordinate the necessary approvals.
- The electrical contractor shall coordinate acceptance test with owner's authorized representatives. A written record must be kept of all required tests.
- Contractor shall erect and maintain all reasonable precautions for safety and health including posting danger signs and other warning against hazards including promulgating safety regulations. Provide safety precautions and barricades for pedestrians at construction vehicle access and egress locations.
- Contractor shall coordinate and sequence all demolition, cleaning and construction work. Contractor shall submit a detailed construction schedule prior to pre-construction conference.
- Contractor shall furnish and install fixed identification at the service entrance equipment (2 locations) indicating the type and location of the on-site stand by power source. Identification signs shall be Bakelite with white lettering on red background. All identification plates shall be engraved with lettering height 1/8" and must be secured with rivets. Example as follows:

ATS Requirements

TAG	LOAD	STEP	TIME (SEC.)	VOLTS	MIN CURRENT AMPS	RATINGS	POLES	φ	WIRES	CLOSING & WITHSTAND
(E) ATS-1	SP-1SP-2	1	10	208	60	3	3	3	65,000	
ATS-2 (SB)BPLL		2	20	208	200	3	3	4	65,000	

- General Notes:
- All units shall have open transition, except as noted.
 - Level 1 ATS
 - Protected by molded-case circuit breaker.
 - Closing and withstanding-current ratings are minimum symmetrical amperes. Rating may be attained by using the ATS manufacturer's closing and withstand ratings. Coordinate withstand ratings of upstream overcurrent protection devices and transfer switches with manufacturer published data.
 - Provide engine startup and shutdown contacts
 - Basin of Design: Power Generation, OTC Power Transfer Switch, Level 2 Control (C204), NEMA 1
 - 5-year parts, labor & travel warranty.
 - Digital Display
 - Training session.
 - 10 second delay between steps.

Generator Requirements

System Type:	Standby Duty (NFPA 70 Art 702 "Optional")
Manufacturer:	Cummins (Basis of Design)
Model:	C60 N6
Alternator:	UC2F
Fuel Type:	Natural Gas
Type:	EPSS Level 1, Type 10, Class 8 (NFPA 110)
Voltage:	208/120V, 3P
Frequency (Hz):	60
kW (Standby):	60
kVA (Standby):	75
Running kW:	13.1 (Calculated Load Data)
Running kVA:	17.2
Pct. Rated Capacity:	21.83%
Emissions:	EPA Stationary Application, NSPS Part 60
Housing Enclosure:	Aluminum, Sound Attenuated Level 2 (ONAN - Basis of Design)
Ave. dB(A) at 7 meters:	69.3
Fuel Consumption (scfh):	933.8 at full load
Min. Operating Pressure (in. H ₂ O):	6
Max. Operating Pressure (in. H ₂ O):	13
Combustion Air (scfm):	149
Coolant System Air Flow (scfm):	5600
Max. Alt. Temp Rise, °C:	100
Alt. Excitation:	PMG
Motor Starting kVA at 1800 RPM:	423
Engine Configuration:	Cast Iron, In line, 6 cylinder
Gross power output (bhp):	100.3

Misc. Requirements:

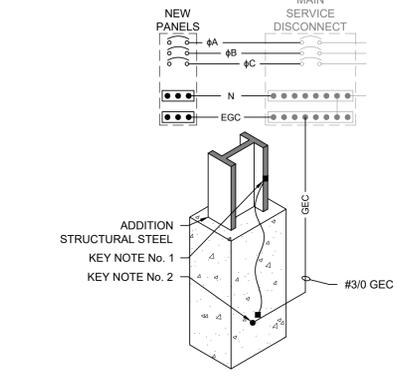
- UL2200 Listed
- Battery Heater
- Battery Charger
- Exterior E-Stop
- Alternator Heater
- Meters - AC Output - 5-Year Preventative Maintenance Contract
- Power Command and 2.3 Control System (UL 508)
- Critical Grade Exhaust Muffler Inside Enclosure
- 208V, Thermostatically Controlled Coolant Heater
- (2) 100% Rated Gen Set Mounted Circuit Breakers
- (1) #12 AWG AT ET Thermal Magnetic (ATS-1)
- (1) #12 AWG AT ET Thermal Magnetic (ATS-2)
- 5-Year Extended Warranty (2500 hours, parts + labor + travel)
- Remote Monitoring - Cummins N34 Protonode Network Monitoring

Riser Diagram General Notes

- All short circuit interrupting ratings shown, whether AIC or MVA IC are calculated 3φ symmetrical values at the line terminals of the equipment, with the exception of 10,000 AIC values. The withstand short circuit current ratings of protective devices, transfer switches and bus ratings shall be equal to or greater than the values indicated.
- Unless otherwise noted all circuit breakers, and/or switches are three (3) pole unless noted otherwise.
- Refer to panelboard schedules for additional information.
- Junction and pull boxes are not necessarily shown on this drawing and shall be provided where necessary and sized in accordance with the National Electrical Code and installed where required.
- Per NEC 110.16, "Flash Protection. Switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers in other than dwelling occupancies, which are likely to require examination, adjustment, servicing, or maintenance while energized, 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, servicing, or maintenance of the equipment." The NEC labeling requirements apply to any electrical equipment installed or modified after 2002. The warning label shall comply with ANSI Z535.4, which specifies colors and signal words to be used.
- Per NEC 408.4(A), every circuit and circuit identification shall be legibly identified as to its clear, evident, and specific purpose of use.
- Where raceways contain conductors 4 AWG and larger and enter an enclosure, the conductors must be protected from abrasion during and after installation by a fitting that provides a smooth, rounded insulating surface, such as an insulating bushing (300.4(F)). For IMC and RMC, a metal or plastic bushing must be installed on conduit threads at terminations in accordance with 300.4(F), unless the design of the box, fitting, or enclosure is such as to afford equivalent protection (344.46 and 342.46).

Panelboard General Requirements

- Breakers for Devices 400 Amps or Less: Protective devices in branch circuit and distribution panels that are rated 400 amperes or less shall be circuit breakers with appropriate short circuit ratings to maintain building coordination. Circuit breakers shall have bolt or screw mounting to bus.
- Provide panelboard interrupting ratings as noted on the drawings. All panelboards shall be FULLY RATED. No Series-Rating is allowed.
- Panel Capacity: All new distribution and branch circuit panels shall have 42 spaces. Panel boards with 84 circuits in one panel are not allowed. Panel boards with 42 circuits and feed-thru tugs to a panel board next to it for a total of 84 circuits are allowed.
- Lockable: All distribution and branch circuit panels shall be lockable. Panel boards shall be door-in-door type.
- Schedule: Each panel shall contain a typewritten schedule. Schedules shall reflect final load descriptions, room numbers, and room names connected to each circuit breaker. Schedules shall be printed on the panelboard directory cards and be installed in the appropriate panelboards. The schedule shall contain complete and detailed information for loads on each circuit. Any changes, additions, or modifications to Panel boards shall require in a new typed directory.
- Buss Material: All panelboard Phase, Neutral, and Equipment Ground busses shall be tinned copper.
- Furnish panelboards with surge protective devices as noted on the drawings.
- UL Compliance: Comply with applicable UL safety standards pertaining to panelboards, accessories, and enclosures. Provide units which have been UL listed and labeled. UL standards are as follows:
Panelboards - UL67, Enclosures for Electrical Equipment - UL50
- NEC Compliance: Comply with the NEC as applicable to the installation of panelboards, cabinets, and cutout boxes.
- NEMA Compliance: Comply with NEMA Stds. Pub. No. 250 "Enclosures for Electrical Equipment (1000-volt maximum)", Pub. No. 1 "Panelboards" and Pub. No. PB1.1, "Instruction for Safe Installation, Operation, and Maintenance of Panelboards Rates 600 Volts and Less".
- NECA Compliance: Comply with NECA's "Standard of Installation".
- Panelboards shall be constructed for top or bottom feeder service, as required by actual project conditions. Contractor to coordinate with field conditions.
- Where "Std" is indicated for an OCPD in the panel schedules, it shall refer to a thermal magnetic circuit breaker unless noted otherwise.



Concrete Embedded Grounding Electrode Detail

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DETAIL KEY NOTES:

- BOND EACH PERIMETER STRUCTURAL STEEL COLUMN TO THE CONCRETE ENCASED MAIN GROUNDING ELECTRODE. USE COMPRESSION CONNECTIONS THAT MEET IEEE 687 REQUIREMENTS OR USE EXOTHERMIC WELDS.
- INSTALL A CONCRETE ENCASED ELECTRODE IN THE BUILDING FOUNDATION. LOCATE ELECTRODE IN THE BOTTOM ONE-THIRD OF THE FOUNDATION WITH AT LEAST 3" OF CONCRETE COVER. USE BARE OR GALVANIZED REBAR THAT ARE MADE ELECTRICALLY CONTINUOUS USING COPPER JUMPERS NOT SMALLER THAN THE REQUIRED GROUNDING ELECTRODE CONDUCTOR. USE REINFORCING BARS NOT SMALLER THAN THE FOLLOWING BASED ON TOTAL LENGTH OF THE INTERCONNECTED AND PARALLEL REBARS.

TOTAL LENGTH	MIN. REBAR SIZE
112 FT	1 1/2" #11 BAR
150 FT	1" #8 BAR
192 FT	3/4" #6 BAR
223 FT	5/8" #5 BAR
268 FT	1/2" #4 BAR

DETAIL GENERAL NOTES:

- INSTALL GROUNDING CONNECTIONS TO BUILDING STRUCTURE AT LOCATIONS THAT ARE VISIBLE AND ACCESSIBLE FOR INSPECTION, MAINTENANCE, AND TESTING.
- TWO WEEKS PRIOR TO THE FINAL INSPECTION, SUBMIT GROUND RESISTANCE FIELD TEST REPORTS TO THE ENGINEER OF RECORD. FIELD TEST REPORTS SHALL INCLUDE A CERTIFICATION BY THE CONTRACTOR THAT THE GROUNDING EQUIPMENT HAS BEEN PROPERLY INSTALLED AND TESTED.
- PUBLICATIONS LISTED BELOW (INCLUDING AMENDMENTS, ADDENDA, REVISIONS, SUPPLEMENTS, AND ERRATA) FORM A PART OF THE CONTRACT DOCUMENTS TO THE EXTENT REFERENCED THEREIN:
 - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE): 81 IEEE GUIDE FOR MEASURING EARTH RESISTIVITY, GROUND IMPEDANCE, AND EARTH SURFACE POTENTIALS OF A GROUND SYSTEM PART 1: NORMAL MEASUREMENTS.

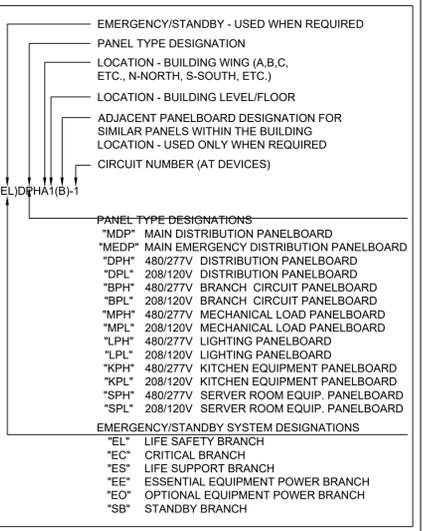
CONDUCTOR LEGEND:

- N - NEUTRAL
- ΦA - PHASE A
- ΦB - PHASE B
- ΦC - PHASE C
- EGC - EQUIPMENT GROUNDING CONDUCTOR
- EG - GROUNDING ELECTRODE CONDUCTOR

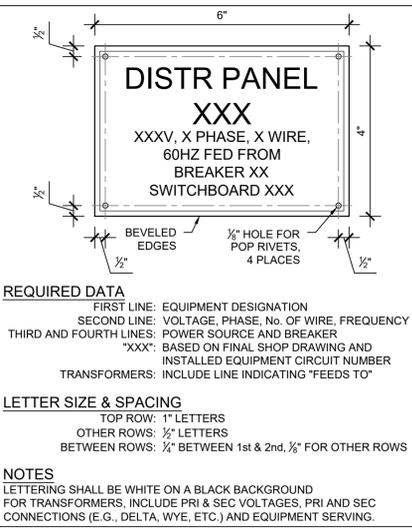
Load Bank Requirements

- MANUFACTURER - Simplex - Vector, Generator Mounted, Radiator Airflow Cooled, Vertical Exhaust Flow (Basis of Design)
- LOAD TEST BANK
 - The load test bank shall be rated 25kW, 60 hertz, 208 Volts, three-phase, four-wire, NEMA 3R, UL Listed with automatic load regulation. Model No. NP-2.0-25kW-2083-60-L- Automatic and manual control.
 - The load test bank shall be furnished as a complete system with necessary controls and devices for manual control with automatic load dump on loss of utility power. Load bank shall be equipped for automatic operation, i.e., shall maintain a minimum 30% load while the generator is in operation.
 - Load Step Resolution: The load shall be able to be stepped in a minimum of 5 steps. Tolerance: ±5 percent overall tolerance, ±2 percent phase-to-phase balance.
 - Control Power: 120 VAC, single-phase control power shall be derived from a local panel via a control power transformer.
 - Overload and overcurrent protection shall be provided for each individual load section and control circuit.
 - The load bank is a completely self-contained, freestanding unit which includes all resistive load elements, load control devices, load element branch circuit fuse protection, main load bus and terminals, cooling system, control power supply, digital controller with malfunction detection system. Outdoor type enclosure.
 - Digital Controller: PLC based with 6-inch color TFT touchscreen with programmable softkeys (HMI) Local or remote control (specify one) When installed, behind weatherproof cover. When remote, installed in type-3R wall mountable enclosure. Capable of multi-remote station control. Capable of limited user programming for time/load sequencing.
 - Powder coated finish to match genset.
- Load bank - automatic operation: digital transducer and current transformers to capture electrical values. Type load bank shall provide the following capability:
 - Display of electrical values on touchscreen: 3-phase voltage, 3-phase amperes, frequency, kW MODBUS registers for these values - Programmable automatic operation:
 - kW sensing automatic load regulation and minimum loading
 - kW sensing regenerative power protection -
 - Automatic sequential step loading
 - Other programmable automatic functions
 - Operator programmable levels, delays, time sequencing.
 - Additional protective features, user activated, user programmable:
 - Over/under voltage
 - Over/under current
 - Over/under frequency
 - Over/under power (kW)
- An authorized representative of the manufacturer shall inspect the installation and shall perform the installation acceptance testing. The owner's authorized representative will be present for the installation inspection and acceptance testing.
- Furnish a written Guarantee that the equipment will meet the specified performance. In addition, the guarantee shall cover the equipment against defects in design, workmanship and material for one (1) year from date of start-up.

Panelboard Naming Convention



Nameplate/Labeling Requirements



GENERAL LABELING REQ.: Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/8" thick for signs up to 20 sq. in. and 1/2" thick for larger sizes. Engraved legend with white letters on black face for normal power, white letters on red face for emergency power. Punched or drilled for mechanical fasteners. Text at 1/2" high lettering.

Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the drawings, inscription and size of letters shall be as shown and shop drawing submitted for approval. Nameplates for panelboards and switchboards shall include the panel designation, voltage, phase and wire. The next item shall be panel name. In addition, describe where the panel is fed from. For example, PANEL 1LA, 120/208V, 3PH, 4W PH1 PANEL FED FROM MDP

The service disconnect shall be labeled as the "Service Disconnect," per NEC 230.70(B).

Per NEC 110.24(A) the maximum available fault current and the date the fault current calculation was performed shall be legibly marked on the service equipment. Example: Maximum available fault current: 33,800

Per NEC 110.16, "Flash Protection. Switchboards, panel boards, industrial control panels, meter socket enclosures, transfer switches and motor control centers in other than dwelling occupancies, which are likely to require examination, adjustment, servicing, or maintenance while energized, 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, servicing, or maintenance of the equipment." The NEC labeling requirements apply to any electrical equipment installed or modified after 2002. Warning label shall comply with ANSI Z535.4, which specifies colors and signal words to be used.

Per NEC 408.4(A), every circuit and circuit identification shall be legibly identified as to its clear, evident, and specific purpose of use.

Per NEC 700.7(B) and NEC 701.7, furnish and install warning label that warns of a shock hazard if the grounding electrode conductor or bonding jumper connection in this type of equipment is removed while alternate energy sources are energized.

Date: 1/10/20
Checked: BH
Drawn: MH

Revisions:
ISSUE TO BO
11/23/20

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PROPOSED RISER DIAGRAM & NOTES
2019 BOND REFERENDUM
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MAMARONECK UNION FREE SCHOOL DISTRICT
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