

SECTION 16620

GENERATOR SETS AND EMERGENCY / STANDBY DISTRIBUTION

Part 1 -Design Directives

Emergency generators shall be designed and installed per NFPA 110, level 1 life safety system. NFPA 110 affects room construction fire ratings that should be reviewed with the architect early in the design phase of the project

Ground fault indicating devices shall only be used when required by code.

Generator distribution shall consist of engine generator, generator distribution panel with main circuit breaker, emergency branch ATS (Automatic Transfer Switches) and, where applicable, one or more standby branch ATS's.

Generator distribution panel shall include generator main circuit breaker(s), full power take-off lugs, door-in-door construction and at least (3) unused three pole circuit breaker positions with bus hardware installed. Additional spaces shall be provided to accommodate anticipated future loads such as emergency feeds to surrounding buildings.

Water jacket and battery heaters shall be connected to a normal power source shall be thermostatically controlled with an adjustable set point and shall automatically de-energize during engine operation. The thermostat shall not be considered as meeting the de-energization requirement. A manual disconnect device shall be installed adjacent to the heater.

Diesel engines shall be 4 cycle, water-cooled.

Engine crankcase vents shall be piped to the exterior or means shall be provided to recycle crankcase vapors without the use of replaceable filters.

Start up service shall include a 4-hour load bank test, one hour at full load.

Engine radiator air discharge ducting shall include a normally open bypass damper with controls that serve to maintain stable air temperature in the generator room during operation.

The radiator or duct mounted resistive load bank shall be sized and connected to present a 50% load to the generator during the weekly automatic test. *The load bank shall have automatic controls energizing the load bank during exercising, dropping out if the load exceeds the generator capacity, and not energizing under an actual outage. During an actual power outage to the building the load bank shall be automatically disconnected from the generator output.*

Two sets of operation and service documentation shall be provided and include all manufacturers' service and repair publications and shall include set up procedures for all unit and system components. Standard owner's manuals shall be supplemented with detailed service information to meet this requirement.

Interlocks between generator controls and the building management system shall be clearly documented on generator control drawings and building management control drawings.

The capacity of the emergency generator fuel supply shall provide a minimum of 24 hours of run time under full load.

For generator fuel system specifications, refer to Dartmouth College Standard Specification Division 15.

Generator installations shall include the following options:

- a) Heavy Duty Air Cleaner
- b) Battery Charger
- c) Battery Heater (exterior applications only)
- d) Water Jacket Heater
- e) Common Failure Relay
- f) Run Relay
- g) Engine Mounted Fuel Pressure Gauge
- h) Isochronous Governor
- i) 1% Voltage Regulation
- j) kW meter
- k) Amp Meter
- l) Electronic Frequency Meter
- m) Over and Under Frequency Protection
- n) Volt Meter
- o) Oil Drain Extension
- p) Fuel Line Water Separator
- q) Critical Silencer
- r) NFPA 110 Control Panel
- s) Hour Meter
- t) Alarm Contacts (open communications protocol such as Lon Works, Modbus, or BACnet)
- u) External Voltage Control
- v) External Speed Control
- w) Cyclic Cranking
- x) *Load bank*

Bathrooms shall have an adequate number of dedicated fixtures to provide egress illumination .
Hallways and stairways shall have the appropriate number of fixtures connected to operate from circuits supplied by the life safety transfer switch.

All lighting and power circuits that require generator backup and are not classified as emergency loads, per NEC 700, shall receive their power from either a legally required standby transfer switch or an optional standby transfer switch per NEC 701/702.

Emergency power shall be provided for the voice / data equipment in the MDF/IDF room.

Part 2 -Products

Acceptable manufacturers are Onan, Kohler and Caterpillar (excluding generator sets utilizing the Cat 3208 engine).

Skid mounted fuel oil tanks shall be equipped with a float type gauge accurate to 2% of the tank volume manufactured by Skully Golden Gauge or approved equal.

Acceptable duct or radiator mounted resistive load bank shall be manufactured by Simplx or Avtron.

Part 3 -Execution

The generator set shall be installed on a housekeeping pad that is a minimum of four inches high and larger in length and width by eight inches over the dimensions of the generator base. The generator base shall be securely fastened to the housekeeping pad in accordance with the requirements of section 16190 testing requirements.

Part 4 Dartmouth College Campus Emergency and Standby Power Systems Matrix

<u>Equipment</u>	<u>EM</u> Emergency	<u>RSB</u> Legally Required Standby	<u>OSB</u> Optional Standby
<i>Interior Egress lighting</i>	X		
<i>Exterior Egress Lighting</i> <i>Discussion: The interpretation of what will be considered as illumination provided to the public way will still be determined on a case by case basis with the Town.</i>	X		
<i>Main Electric Rooms Lighting</i>	X		
<i>Small Electric Rooms / Closets Lighting</i> <i>Discussion: At this time, lighting of these areas may or may not be allowed to be on the emergency branch. Follow –up on this item is required.</i>			
<i>Large Mechanical, other Maintenance Rms Lighting</i> <i>Clarification: Where these areas are large enough so that the egress is defined, egress lighting shall be on the emergency branch.</i>	X		
<i>Generator Rooms Lighting</i>	X		
<i>Fire Pump</i>	X		
<i>Fire Alarm System</i>	X		
<i>Generator operation equipment (fuel pumps, dampers, etc.)</i>	X		
<i>Systems Providing 911 Communications:</i>		X	
<i>Voice over IP (VoIP) equipment</i>		X	
<i>Code Blue Phones</i>		X	
<i>Elevator phones</i>		X	
<i>Panic Button</i>		X	
<i>Systems Providing Notification to Campus S&S:</i>			
<i>Code Blue Phones</i>		X	
<i>Radio System</i>		X	

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<i>Elevator phones</i>		X	
<i>Panic Button</i>		X	
<i>Radio System</i> <i>Discussion: There may be authorities who will consider this system to be classified as an emergency system (Police, Fire).</i>	X	X	
<i>Elevator - when Required by IBC</i>		X	
<i>Elevator - when Not Required by IBC</i>			X
<i>Smoke Evacuation System</i> <i>Smoke Control System per IBC Section 909 (2006 Ed.)</i> <i>Discussion: Jeryl Frankenfield qualified the requirement that this system not be delayed in starting and definitely never be load shed. Laura Black intends to research the costs related to the exhaust fan being listed for emergency use in case it makes sense to classify this load as EM rather than RSB.</i>		X	
<i>Smoke Control – exhaust fans</i> <i>Discussion: This load will be required by IBC 2006 for continuous exhaust of bathrooms' vertical shafts</i> <i>Duct & Air Transfer Protection per IBC Section 716 (2006 Ed.), including smoke dampers and exhaust fans per IBC Section 716.5.3</i>		X	
<i>Sewage Ejection Pumps</i> <i>Discussion: This load has been considered a RSB load in the past.</i>			X (Verify)
<i>Kitchen Hood Exhaust</i>			X
<i>Fume Hood Exhaust</i> <i>Discussion: This load is classified as OSB as long as it is not handling high hazard fumes.</i>			X
<i>Access Control System</i> <i>Discussion: This system will be allowed on RSB if no OSB is available in the building/site.</i>		(X)	X
<i>Security System</i> <i>Discussion: This system may be classified as RSB if so stated by an Authority Having Jurisdiction.</i>		(X)	X
<i>Automatic Door Operators (for ADA)</i> <i>Discussion: Ryan Borkowski will provide final classification of these devices.</i>			