

## WHEN TO USE THIS BASIS OF DESIGN SECTION

This section should be used for both new construction projects and rehab project when considering back-up power generation. The objective is to guide the design and installation of back-up power to cover the loads required by local building codes, important site-specific loads (i.e. septic system pumps) and if possible an area of refuge. The area of refuge (see graphic 2) is a location in the building residents can inhabit in case of a prolonged power outage. The requirements listed in this section are intended to serve as minimum standards. Projects may exceed these requirements as circumstances allow.

## REQUIREMENTS:

**Existing Generators:** For properties with an existing generator: evaluate the capacity and loads covered by the existing back-up power system. When replacing the back-up power system increase the size (if necessary) to add resilient loads as described below.

**Existing Buildings without Generators:** For properties without back-up power: evaluate the feasibility of adding an Energy Storage System (ESS) as the source of back-up power. If it is not feasible, install a generator sized to cover all code related loads and the resilient loads listed below. The gas or electric service will need to be evaluated to determine if upgrades are necessary to support the fuel or service needed to power the generator.

**New Construction Buildings:** All new construction projects should include a back-up power system capable of accommodating code required loads and resilient loads.



## BACK-UP POWER

**Fuel Source:** Local codes may dictate the required fuel source. Diesel fueled generators are preferred as diesel engines are more reliable. Any generator larger than 100 kW should only use diesel fuel.

- **Diesel:** Any diesel tank greater than 500 kW need to be certified by the fire chief. Only use #2 off-road diesel fuel. Do not use any type of bio fuel with a diesel tank. Weekly testing of the generator is imperative to ensure the fuel is constantly moving in the tank. The diesel tank should also be checked once a year to maintain the quality of the fuel. If the generator is diesel fueled and located on a roof, work with an engineer to design a flow pump system to pump diesel from a ground level tank to the roof level tank.

- **Natural Gas:** If natural gas is used and pressure is an issue, a generator with low pressure capability will be needed. Be aware that in some power outages caused by a natural disaster, the utility company will shut off natural gas service, rendering the generator unusable. Most plumbing codes will require flexible connections between the gas supply and the gas inlet of the generator.

- **Battery:** If local building and fire department codes allow, consider an Energy Storage System (ESS) or battery for back-up power. This applies to new construction and rehab projects, especially if a solar PV system is in place or planned for the future.

**Emissions Regulations:** Some states regulate generator exhaust emissions. Regardless of regulations, specify a generator with a catalytic converter.

**Run Time:** The run time will vary based on the loads the generator is designed to carry and the duration the loads need to be accommodated.

**Location:** The generator must be installed in a location that allows proper exhaust. Consult any local zoning regulations that may dictate minimum distances from the generator to property lines or other nearby structures. Distance from windows, fresh air intakes, patios and balconies and outdoor amenity space should also be reviewed as part of the building permit. Generators should also be in a location away from potential water intrusion from gutters and sprinklers.

**Support Structure:** Steel should be used for any/all generator structural supports. Wood is not permitted.

**Housing/Enclosure:** Check local noise ordinances and design the back-up power system enclosure to mitigate sound while allowing proper airflow and exhaust.

**Code-Required Emergency Loads:** Electrical engineer to size back-up power to accommodate any building code requirements. These loads may include the following:

- Fire alarm panel\*
- Elevators
- Fire pump (sprinkler system)
- Lighting (corridors/ stairwells)\*
- ADA devices (door openers)

*\*These items can include integral back up power. POAH's preference is for them to include integral batteries.*

### **Additional Loads to Consider:**

- Electric door strikes/latch at building entrances (if not on back-up power the doors need to go to fail-safe mode)
- Garage ventilation
- Domestic water boost pump

**Resilient Loads:** Generators should be sized appropriately to address resilient loads as follows:

- Septic/sewer ejector pumps
- Community space lights and plugs
- Community space kitchenette and refrigerator (for medication)
- Community space HVAC
- Office lights and lugs
- Heating system pumps if heat is provided in a hydronic system powered by fossil fuel

**Testing:** Follow any local codes or utility regulations for testing and run time log documentation. NFPA 99 and 110 provide regulations for this testing in certain building types and is considered good practice for all building types. To ensure back-up power system is operating properly, all generators must be tested weekly for 20-30 minutes.

**Service Contracts:** All generators must have a service contract in place for routine testing and maintenance. Diesel powered generators should be inspected and cleaned (if necessary) on an annual basis.

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**Remote Monitoring:** Any remote monitoring should use cell-based monitoring which is more reliable in the event of a power outage.

**Preventative Maintenance:** Generators should be test run once a week for 20-30 minutes to ensure performance. Diesel powered generators should be serviced no less than annually to inspect and clean if necessary. Ensure that no debris (i.e. leaves, grass, branches) is allowed to collect around the generator.

**Climate Considerations:** Properties located in areas prone to snow should ensure back-up power systems are part of the snow removal plans to confirm exhaust isn't blocked. Properties located in a flood zone or area of increased flooding need to ensure generators are installed on structures above the designated flood level. If the property is in a coastal climate with exposure to harsh salt air, consult a generator technician about the best coating or protection for the generator and support structure to prevent rust from forming.

### AREA OF REFUGE:

**Code Regulations:** Follow all national, state, and local codes for the design and location of all generators. New and updated back-up power will likely require an electrical permit.

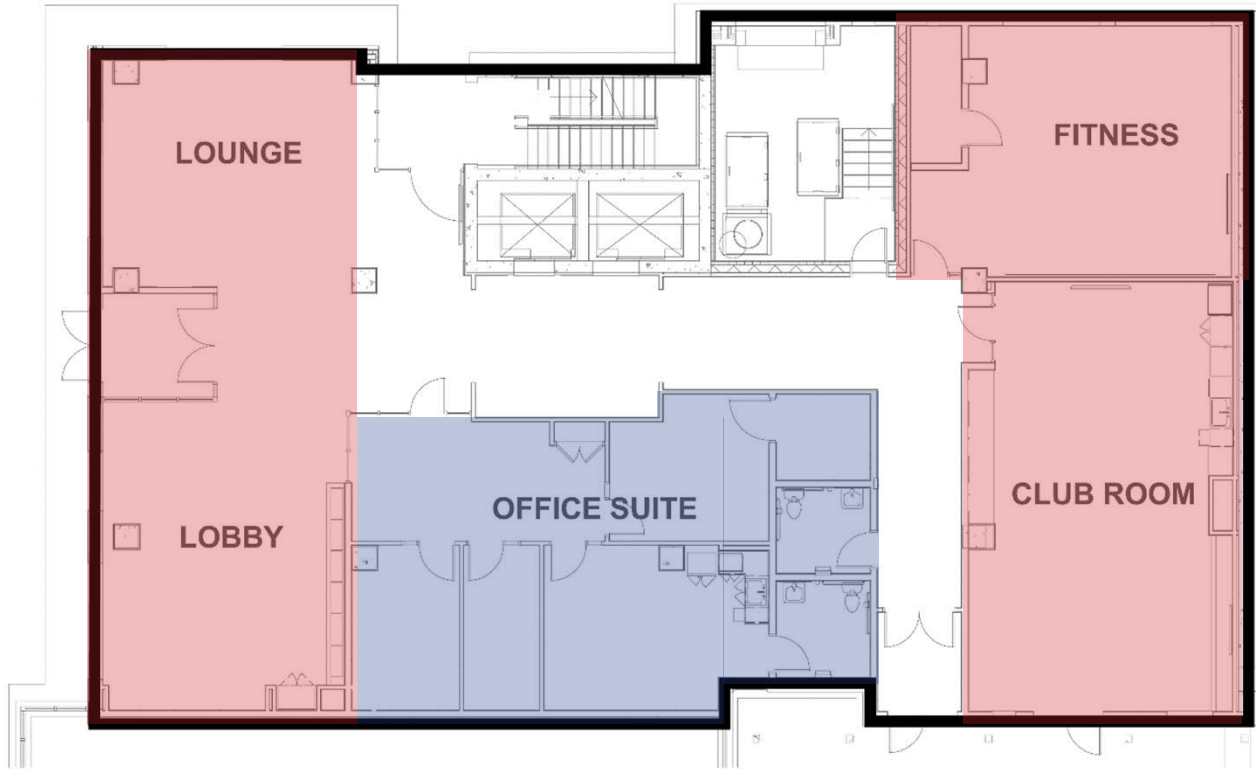
**Automatic Standby:** All generators should include an automatic transfer switch to activate the back-up power in an outage to prevent service disruption. Each meter included on the generator will need its own transfer switch. The transfer switch is connected to the utility panel(s) where the critical loads are located. See graphic below.

### REQUIRED DETAILS:

**Design:** This space should include the property management office suite and a community space for residents. The space should include a bathroom and kitchenette.

**Electric Loads Required:** The HVAC and DHW systems, lighting, and all plugs should be powered by a generator. These loads are imperative to maintain comfort levels, power devices and provide refrigeration for resident medications.

# BACK-UP POWER



Graphic 2: This plan highlights the common spaces in a building which are included in its area of refuge. All plugs, lighting, heating, cooling, ventilation and DHW for this area (typically on the first floor) are powered by the generator. This includes the refrigerator for resident medication.