



COMMERCIAL GENERATORS: An integral part of any business preparedness plan

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Power outages resulting from unpredictable weather, man-made or natural disasters, or site-specific events can disrupt your business operations. The Insurance Institute for Business & Home Safety's (IBHS) Open for Business® program is a comprehensive disaster planning tool to assist you in reducing the potential for loss and recovering quickly should a disaster strike, no matter what the cause.

One important consideration as you develop your business continuity plan is the purchase, operation and maintenance of a generator. This fall-back tool enables you to continue operating some or all of your electronic equipment and lights and minimize business interruptions. This article will provide basic information about generators; however it is not intended to be a comprehensive guide for using generators. Always consult the manufacturer's instructions for complete information.



Generators are an integral part of the preparedness planning process for businesses of every size and can greatly reduce business disruption when normal power is interrupted. At the same time, using a generator poses certain risks that must be addressed for safe operation, including fire, damage to electrical equipment, and even injury or death to those operating the generator or working in the building where it is being used. Proper ventilation is a critical element for reducing the risk of carbon monoxide poisoning from a generator's engine exhaust.

In addition to safety concerns, proper maintenance is critical to avoid the failure of a generator when it's needed most. The time to maintain a generator is well before a major storm or disaster strikes; when professional assistance may be unavailable, power lines are down, and access roads are blocked. To gain the greatest business continuity benefits, while minimizing associated risks, it's important to purchase a generator that is properly designed and sized for your business needs. Once purchased and properly installed, put procedures in place to ensure regular maintenance and that all safe operating practices are followed. Business and building owners should always operate and maintain generators in accordance with the manufacturers' recommendations.

CHOOSING A GENERATOR AND RELATED SUPPLIES

Before purchasing an electrical power generator, consider what electrical equipment that must be operable when normal power is interrupted. Other considerations include:

- How often does the business lose power and for how long?
- What are the most likely sources of power outages?
- The [Open for Business® vulnerability assessment](#) will help you to identify the events that could interrupt business operations. These factors will help to determine the size and type of generator to buy.

One threshold question facing the business owner is whether to purchase a portable or back-up generator, or to choose a permanent or stand-by generator. A portable generator is a relatively small machine, which is usually rated no higher than 15 kilowatts and 240 volts, and is intended to be moved and activated for temporary use at a location where utility-supplied electric power is not available. A standby generator, in contrast, is a back-up electrical system that is permanently installed and may operate automatically through the use of a transfer switch, which senses a power loss, commands the generator to start, and then transfers the selected electrical load to the generator.

FACTS ABOUT PORTABLE GENERATORS

- Portable generators are less expensive to purchase and install than permanent (standby) generators. Without a supplemental fuel supply, they have a relatively short run-time and may need to be refueled several times a day during a prolonged power outage.



The above portable generator can be used for small businesses, or in remote locations.

- Most portable generators are designed to work with a few appliances or pieces of electrical equipment that may be plugged directly into the generator without the use of a generator transfer switch.
 - o Who should choose this type of generator?
 - This type of generator be could especially useful for small to mid-sized businesses or in remote locations, but it isn't recommended if you are operating sensitive equipment or have numerous large appliances or business machines.
- It is critical to determine ahead of time what electrical items will be needed during a power outage in order to choose the properly sized generator, and to determine how each item will be connected to the generator.
 - o Is a portable generator right for your business?
 - Referring to the critical business functions identified in your business continuity plan, and the electrical equipment upon which they depend, will help you decide if a portable generator is sufficient.

GENERATOR SAFETY

- It is very important not to overload a generator. Generator operating manuals typically provide guidelines on power consumption of appliances such as refrigerators, fans, televisions, window mounted air conditioners, etc. but not large commercial equipment.
- A business owner may contact a certified electrician to conduct an electrical load analysis of his building and equipment to determine the power consumption of the entire building and individual electrical equipment.

- When using a portable generator, you also will have to purchase an electric power cord to feed the electrical equipment. This should be a heavy duty outdoor-rated extension cord sized for the total electrical load (voltage and amps) you may need.
 - o Choose a cord that exceeds the total expected load in order to prevent excessive heat buildup and degradation of the power cord. An overloaded power cord can potentially start a fire.
 - o Ensure that the cord has three prongs and has no splits, cuts or holes in the external insulation covering.
- For businesses with multiple locations it may be too expensive to provide generators at each location, so another option may be a rental or lease agreement to have a generator be delivered prior to or immediately after a storm.
 - o When relying on a rented generator, an option for larger businesses is a generator docking station (sometimes referred to as a storm switch) in the building specifications or as a retrofit readies the building for emergency mobile power. This flexible "as needed, where needed" approach gives building owners the peace of mind of knowing that equipment needs have been accounted for prior to the power outage. Additionally, the plug and play technology eliminates hard wiring of large generators during an emergency which requires a licensed electrician onsite to perform the task. Note that the docking station enclosure or individual components may be UL listed, but it is important to make sure the complete assembly is UL 1008 listed.

FACTS ABOUT PERMANENT GENERATORS

- A permanent generator is typically wired into your building's electrical system through a generator transfer switch.
- When these switches sense a power outage they will isolate your "emergency" electrical wiring, providing power to the selected equipment from the normal power source, then start to transfer the "emergency" load to the generator.
- When the power is restored, the switch also will connect "emergency" circuits back to the utility lines and turn off the generator.
- In addition to the convenience of automatic switching, permanent generators offer higher power levels compared to portable units and longer run times.

- A permanent generator should be compatible with the fuels available in your area — most models operate with natural gas, propane, or on a bi-fuel basis.

PURCHASE AND INSTALLATION

IBHS recommends retaining an expert with extensive experience with all types of generators to assist with choosing the design and installation of the right generator; specific attention should be paid to the applications required to meet your business needs.

IBHS offers the following guidelines to help you with this process:

- Use local contractors, and ask for recommendations and references. Consult with several contractors in-person prior to making a decision.
- Make sure the chosen expert helps select the right size generator for your needs. This will include a determination of wattage needs (constant and start-up) and voltage ratings. You also should make sure that whatever generator is chosen is rated to provide power at a frequency of 60 hertz.
- Obtain all estimates in writing; including specifics about the work to be performed and the contractor's license information.
- Ask for proof of insurance, for both the manufacturer of the generator and the contractor, as well as a written warranty from the manufacturer and a guarantee from the contractor.
- Include the manufacturer and the contractor on the suppliers/vendor forms in your Open for Business® or other business continuity plan.
- There may be local codes that require permits and inspections of plans and installation practices. Additionally, any generator transfer switch should be installed by a licensed electrician in order to comply with the National Electrical Code (NEC) as outlined in the National Fire Protection Association Publication No. 72. Some states also have safety regulations designed to prevent "back feed" (see below).
- Be sure the contractor walks you through the operations and maintenance processes of the generator. You should also be given all of the operational manuals provided by the manufacturer for reference.

TESTING, MAINTENANCE AND OPERATIONS

Most emergency generator failures are typically caused by poor testing and maintenance practices. Testing of permanently installed generators should include simulating a real power failure. This practice will test the transfer switch's function and the generator at the same time.

Please note: Only running the generator will not test the transfer switch's function, which is a critical element to proper operation during power outage.

- Regularly scheduled testing and maintenance of emergency generator equipment is essential to ensure peak performance when you need it most. Maintenance contracts with third parties are a good way to make sure your system achieves prime performance.
- Generators — portable or permanently installed — require the use of fuel. Diesel fuel is more prone to oxidation than gasoline, and should never be stored for longer than 12 months. If there are plans to store fuel, a fuel stabilizer should be added.
- Many generators use fuel filters to prevent impurities from clogging the fuel lines. Fuel filters should be maintained in accordance with the equipment manufacturers' recommendations to prevent this problem.
- Proper coolant level is critical to the operation of a generator. Check coolant levels prior to start up and monthly for maintenance.
- Like any engine, a generator uses oil. Use the right type of oil, maintain the proper oil level and change the oil when it appears dirty.
- Check that all air vents or louvers are in good condition, free of dirt and debris, and, if required, that they move freely during operation.
- Visually inspect the condition of all hoses, gaskets and gauges to ensure these are free of cracks and operational without leaks.
- At start up, check that operating pressures and temperatures are stable and within the manufacturers design parameters.
- Also, when the engine is running, check for unusual engine noise and knocking. If there are any unusual sounds, turn the generator off and have it inspected by a professional.
- Maintain a log of all test operations and record all readings.

- In the event of an impending storm that could result in power outages, test the generator system and top off all liquids at the conclusion of the test.
- Do not tamper with safety devices or attempt to repair the generator unless you are a qualified service person.
- The total electrical load on your generator should never exceed the manufacturer's rating.

SAFETY ISSUES

Generators that are improperly installed, maintained or used can cause a fire, damage electrical equipment, or result in injury or death. The following information is intended to help address these risks:

- Carbon monoxide (CO) poisoning from engine exhaust is a common and serious danger that can result in death if generators are used improperly, in particular, if the fuel is not burned completely.
- Because CO is invisible and odorless, business and/or building owners should install a CO detector to warn of rising CO levels, and test it monthly.



A carbon monoxide (CO) detector like the one shown above looks similar to a smoke detector and can greatly reduce your risk of CO poisoning when using a generator.

- Never use generators indoors or outside near windows, vents, or air intakes that could allow CO to come indoors.
- Maintain plenty of air flow space around the generator.
- When using an emergency electric power generator, get fresh air immediately if you begin to feel flu like symptoms, sick, dizzy or light headed.
- Carefully follow all instructions on properly "grounding" the generator.

Keep the generator dry. If needed, operate portable generators under an open canopy type structure. Short circuits may occur in wet conditions resulting in the generator catching fire.

FUEL

- Store fuel in an approved storage container or holding tank designed for such use, and only use fuel that is recommended in the owner's manual.
- Never store fuel indoors.
- Do not keep fuel near the electric generator while the electric generator is in use, as it could start a fire.
- Never refuel while the generator is running, and always keep a fully charged fire extinguisher located nearby.
- To avoid electric shock or electrocution, do not work on any type of generator without following standard lock out, tag out procedures as prescribed by the Occupational Safety & Health Administration (OSHA) to ascertain that the generator power supply is off and may not be accidentally turned on.
- Keep cords out of the way to avoid injury, but in plain view to allow for visual inspections of any damage, such as fraying or cuts, that could result in a fire.

AVOID BACK FEEDING

- Do not "back feed" power into your electrical system by plugging the generator into a wall outlet. Back feeding will put you and potentially others, including utility line workers, at serious risk because the utility transformer can increase the low voltage from the generator to thousands of volts. Some states have laws that make the generator owner responsible for taking steps to make sure that the generator's electricity cannot feed back into the power lines, and for notifying the local utility of the location of any commercial, industrial, or residential generator.
- The exterior portions of a generator, even those operated for only a short period of time, can become hot. Avoid touching the generator without protective gear and keep debris clear to avoid a fire.

MAXIMIZE YOUR INVESTMENT

- Commercial generators are a valuable business continuity tool in our "plugged in" economy. They can be vital for keeping your business operational in the event of an emergency, and provide convenience and peace of mind in the event of a power loss.

IBHS recommends business and building owners spend time working with a professional to assist in the design, purchase, installation, operation, and maintenance of generators. This will help create a system that meets your needs and ensure its safe operation in your workplace. For additional assistance in creating a business continuity plan tailored to the needs of your specific operation, please visit disastersafety.org/open-for-business/ofb to download a free copy of Open for Business®.