



## **Portable Generator Safety**

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## **Portable Generator Safety**

**During the process of restoring electric power to a neighborhood Line Crews are told to avoid working on power lines where portable generators are heard!**

**Why? Because generators present a serious electrocution hazard!**



**This presentation has compiled information on the hazards of using portable generators in homes during prolonged power outages. The Contents to be discussed are as follows:**

## **Contents:**

- 1. CARBON MONOXIDE HAZARD**
- 2. USE GENERATORS CAREFULLY**
- 3. PERMANENTLY CONNECTED GENERATORS**
- 4. PORTABLE GENERATOR UNIT SUPPLYING SELECTED UNITS**
  - a. ELECTRICAL HAZARDS**
  - b. FIRE HAZARDS**
  - c. POWERING APPLIANCES FROM A PORTABLE GENERATOR**
- 5. PURCHASING A GENERATOR**
- 6. USING A GENERATOR**
- 7. WHEN DISASTER STRIKES**
- 8. INFORMATION THAT SHOULD BE SUPPLIED WITH A PORTABLE GENERATOR**

# Consumer Product Safety Commission Safety Alert

The primary hazards to avoid when using a generator are carbon monoxide (CO) poisoning from the toxic engine exhaust, electric shock or electrocution, and fire.

Every year, people die in incidents related to portable generator use. Most of the incidents associated with portable generators reported to CPSC involve CO poisoning from generators used indoors or in partially-enclosed spaces.

## Carbon Monoxide Hazards

**Under no circumstances should portable generators be used indoors**, including inside a garage, carport, basement, crawlspace, or other enclosed or partially-enclosed area, even with ventilation. Opening doors and windows or using fans will not prevent CO buildup in the home. Generators can produce high levels of CO very quickly. When you use a portable generator, remember that you cannot smell or see CO. Even if you can't smell exhaust fumes, you may still be exposed to CO.

If you start to feel sick, dizzy, or weak while using a generator, get to fresh air **RIGHT AWAY. DO NOT DELAY**. The CO from generators can rapidly lead to full incapacitation and death.

If you experience serious symptoms, get medical attention immediately. Inform medical staff that CO poisoning is suspected. If you experienced symptoms while indoors have someone call the fire department to determine when it is safe to re-enter the building. **DO NOT DELAY!**

Follow these safety tips to protect against CO poisoning:

- **NEVER** use a generator indoors, including in homes, garages, basements, crawl spaces, and other enclosed or partially-enclosed areas, even with ventilation. The generator needs a minimum of 3 to 4 feet of spacing on all sides (including the top). A generator needs an unlimited supply of fresh air for proper cooling during operation. Because you may have windows open to get fresh air while the power is out, be sure to place the generator away from open doors and windows or using fans will not prevent CO build-up in the home. The generator will need some type of temporary shelter to prevent exposure to rain or moisture.
- Follow the instructions that come with your generator. Locate the unit outdoors and away from doors, windows, and vents that could allow CO to come indoors.
- Install battery-operated CO alarms or plug-in CO alarms with battery back-up in your home, according to the manufacturer's installation instructions. The CO alarms should be certified to the requirements of the latest safety standards for CO alarms (UL 2034, IAS 6-96, or CSA 6.19.01).
- Test your CO alarms frequently and replace dead batteries.

Incidents associated with portable generators reported to the Consumer Product Safety Commission (CPSC) most commonly involve CO poisoning from generators used indoors or in partially-enclosed spaces.

## USE GENERATORS CAREFULLY

### Never plug or connect a portable generator directly into your home electric circuits!

There are two ways you can use a generator to supply power to your home.

1. permanently connected to your house circuit
2. as a portable unit supplying selected electrical appliances

**Read and adhere to the manufacturer's instructions for safe operation.**

Don't cut corners when it comes to safety. Carefully read and observe all instructions in your portable electric generator's owner manual.

## PERMANENTLY CONNECTED GENERATORS

A generator may be connected to your house circuit, but this must be done by a **Licensed Electrical Contractor** and must meet the National Electrical Code and local permitting and inspection regulations. A permanently wired **transfer switches** must be installed to ensure that at no time is parallel operation possible, and effective isolation is maintained between all active conductors of the load being supplied by the generator and the electrical installation connected to supply from the electric utility. For power outages, permanently installed stationary generators are better suited for providing backup power to the home. Even a properly connected portable generator can become overloaded. This may result in overheating or stressing the generator components, possibly leading to a generator failure. Be sure to read instructions that come with the generator to make sure you operate it within its limitations for power output.

# PORTABLE GENERATOR UNIT SUPPLYING SELECTED UNITS

## Electrical Hazards

Follow these tips to protect against shock and electrocution:

- Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands if wet before touching the generator.
- Plug appliances directly into the generator. Or, use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin.
- **NEVER** try to power the house wiring by plugging the generator into a wall outlet, a practice known as “back feeding.” This is an extremely dangerous practice that presents an electrocution risk to utility workers and neighbors served by the same utility transformer. It also bypasses some of the built-in household circuit protection devices. If the generator is running without isolation from the main electric system a situation called “cross phasing” will occur. **The result may be simple burning up of the portable generator or catastrophic explosion and fire!**
- If you must connect the generator to the house wiring to power appliances, have a qualified electrician install the appropriate equipment in accordance with local electrical codes. Or, check with your utility company to see if it can install an appropriate power transfer switch.
- For power outages, permanently installed stationary generators are better suited for providing backup power to the home. Even a properly connected portable generator can become overloaded. This may result in overheating or stressing the generator components, possibly leading to a generator failure.
- Always read the owners manual before operating your portable generator for back up power.
- To prevent electrical shock, make sure your generator is properly grounded. Consult your manufacturer's manual for correct grounding procedures.
- **Keep children away from portable electric generators at all times.**
- **Never plug a portable electric generator into a regular household outlet.** Plugging a generator into a regular household outlet can energize “dead” power lines and injure neighbors or utility workers. Connect individual appliances that have their outdoor-rated power cords directly to the receptacle outlet of the generator, or connect these cord-connected appliances to the generator with the appropriate outdoor-rated power cord having a sufficient wire gauge to handle the electrical load.
- **Use the proper power cords.** Plug individual appliances into the generator using heavy-duty, outdoor-rated cords with a wire gauge adequate for the appliance load. Overloaded cords can cause fires or equipment damage. Don't use extension cords with exposed wires or worn shielding. Make sure the cords from the generator don't present a tripping

hazard. Don't run cords under rugs where heat might build up or cord damage may go unnoticed.

- To avoid electrocution, keep the generator dry and do not use in rain or wet conditions. To protect the generator from moisture, operate it on a dry surface under an open canopy-like structure, such as under a tarp held up on poles. Dry your hands if wet before touching the generator.

The safe application of power to your home is achieved simply by using a quality extension cord and surge protected power board from the generator directly to the appliance that you want to power.

By Calculating the power requirement of the electrical appliances you have in your home you can determine which appliances can be powered safely. During power outages the main concern is for powering sufficient light for the safety of your family. If power is out for several hours you will want to power your refrigerator and freezer to insure that no food spoilage occurs. It may not be necessary to continually power all the appliances you want to use (as refrigerators will maintain their cold for many hours). So power management will allow you to utilize a small generator to separately power several appliances safely.

## Fire Hazards

Follow these tips to prevent fires:

- **Do not store fuel indoors or try to refuel a generator while it's running.**
- Never store fuel for your generator in the home. Gasoline, propane, kerosene, and other flammable liquids should be stored outside of living areas in properly-labeled, non-glass safety containers. Do not store them near a fuel-burning appliance, such as a natural gas water heater in a garage. If the fuel is spilled or the container is not sealed properly, invisible vapors from the fuel can travel along the ground and can be ignited by the appliance's pilot light or by arcs from electric switches in the appliance.
- Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.
- Turn off all equipment powered by the generator before shutting down your generator.
- Avoid getting burned.  
Many generator parts are hot enough to burn you during operation.
- Do not operate the engine near combustible materials.
- Maintain your generator engine according to the maintenance schedule for peak performance and safety.
- Keep gas fresh. If you do not plan to use your generator for up to 30 days, stabilize the gas with a gas stabilizer.
- Do not leave your generator unattended. If you have to leave home or leave it, turn it off.

## **POWERING APPLIANCES FROM A PORTABLE GENERATOR**

Be sure to check the wattage of the appliances you'll be connecting, to ensure that the electrical load doesn't exceed the generator manufacturer's rating. A refrigerator or freezer compressor motor will not start unless the generator size is several times larger than the power rating appliance. Try to avoid excessive use of extension cords with your generator; if you must use them, make sure they are the correct current rating. Using an ordinary extension cord on a large appliance can cause it to overheat, leading to damage to the appliance or even a fire. You can calculate the electrical loading of your appliances by the power loading (wattage rating) that is marked on the nameplate of the appliance. Add up all the wattage values of the equipment you want to have on to give an indication of the power load requirements your generator will need to supply. For appliances with motors the generator will need to be able to supply the starting watts.

As an example the common power ratings of some appliances are listed:

*Refrigerator or Freezer – around 1800 starting watts, 180 watts normal running*

*Portable radio - 5 watts to 45 Watts*

*Light - 40 watts to 100 watts (the wattage is marked on the light globe)*

*Stereo system - 65 watts*

*Garage Door Opener – up to 1,400 starting watts*

*Electric Fry Pan - 1,300 watts*

*Coffee Maker - 1,750 watts to 2400 watts*

*Microwave Oven - 625 watts to 1,000 watts*

*Television - 40 watts for a 20 inch up to 180 watts for an 80 inch screen*

*Air conditioner – up to 8000 starting watts for small window mount unit (and 1200 watts normal running); up to 30000 starting watts for a large split system (and 6000 watts normal running)*

## **Purchasing a Generator**

If you choose to buy a generator, make sure you get one that is rated for the amount of power that you think you will need. Look at the labels on lighting, appliances, and equipment you plan to connect to the generator to determine the amount of power that will be needed to operate the equipment. For lighting, the wattage of the light bulb indicates the power needed. Appliances and equipment usually have labels indicating power requirements on them. Choose a generator that produces more power than will be drawn by the combination of lighting, appliances, and equipment you plan to connect to the generator including the initial surge when it is turned on. If your generator does not produce adequate power for all your needs, plan to stagger the operating times for various equipment. If you can not determine the amount of power that will be needed, ask an electrician to determine that for you. (If your equipment draws more power than the generator can produce, then you may blow a fuse on the generator or damage the connected equipment.)



## Using a Generator

**Be sure to turn the generator off and let it cool down before refueling.** Gasoline spilled on hot engine parts could ignite.

Store fuel for the generator in an approved safety can. Use the type of fuel recommended in the instructions or on the label on the generator. Local laws may restrict the amount of fuel you may store, or the storage location.

Ask your local fire department for additional information about local regulations. Store the fuel outside of living areas in a locked shed or other protected area. Do not store it near a fuel-burning appliance, such as a natural gas water heater in a garage. If the fuel is spilled or the container is not sealed properly, invisible vapors from the fuel can travel along the ground and can be ignited by the appliance's pilot light or by arcs from electric switches in the appliance.

## When Disaster Strikes

**Plug appliances directly into the generator. Or, use a heavy duty, outdoor-rated extension cord** that is rated

(in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Never try to power the house wiring

by plugging the generator into a wall outlet, a practice known as "back feeding." This is an extremely dangerous

practice that presents an electrocution risk to utility workers and neighbors served by the same utility transformer.

It also bypasses some of the built-in household protection devices.

## INFORMATION THAT SHOULD BE SUPPLIED WITH A PORTABLE GENERATOR

### INFORMATION TO BE PROVIDED WITH ENQUIRY AND ORDER

The following information should be supplied by intending purchasers with inquiries and orders for generating sets.

(a) The intended usage, or dominant load, e.g.:

(i) Leisure, sports, camping: lights, cooking appliances, refrigeration.

(ii) Light industrial: portable tools.

(iii) Domestic household: mains-failure back-up.

(iv) Industrial, construction and building trades: tools.

(v) Marine applications.

(vi) Special requirements, e.g. high ambient temperature, high altitude, or both.

(b) If the set is to drive electric motors, e.g. refrigerators, grinders, pumps, fans, air conditioners.

(c) The intended operating periods, e.g.:

(i) Number of hours per day, week, or month, as appropriate.

(ii) Maximum usage on one occasion, in hours.

(iii) Expected usage before engine overhaul, in years.

NOTE: The specification of a lengthy period before overhaul may involve considerable additional cost.

(d) The fuel to be used, e.g. grade of gasoline gasoline-oil mixture (2-stroke); diesel; other, e.g. LPG.

(e) Voltage, frequency, phases, e.g. 240 V 50 Hz, single-phase.

(f) The output required, in watts or kilowatts and load power factor.

NOTES:

1. Note the marked load of each item you intend to use simultaneously and add them. Make allowance for motor-operated appliances like air conditioners, refrigerators and freezers which briefly, on starting, take two to ten times rated load.

2. Consider a larger output if you require reduced variations in voltage and frequency due to load changes, e.g. with sensitive electronic equipment.

(g) If 15 A plug-sockets are to be provided

(h) If a lower noise level is required

(i) If manual setting of voltage or closer automatic control of voltage is required.

(j) If a voltmeter or ammeter is required.

(k) If a better voltage waveform is required

(l) If the generator short-circuit withstand is required to be checked by test and the generator voltage at which such a test is to be carried out

(m) If a special lifting arrangement, e.g. single-point lifting, is required.

(n) Any special protection of the ignition system, if any, from the ingress or deposition of moisture, or of the engine intake from ingress of water.

(o) Any special protection against fungus growth (in the tropics), salty atmospheres (in coastal areas), or corrosion (in industrial environments).

(p) If a larger capacity fuel tank is required.

(q) Any special protection of electrical equipment against ingress of objects, dust, or water.

(r) If routine testing of noise, vibration, or fuel consumption is required.

Sources:

**American Red Cross** with technical advice from the National Fire Protection Association (publisher of the National Electric Code®) and the U.S. Consumer Product Safety Commission.

Revised and updated September 2004.

**American Honda Motor Co., Inc.**

**U.S. Consumer Product Safety Commission**

**Dominion**

**MedicineNet, Inc.**