Backup Power Solutions for Homes in PAP

Please don't take this as advice from an expert – it's merely a layman's view of some common solutions that could be considered by a reader for further investigation before making any decisions. Qualified and experienced persons should be consulted for advice or used to perform any necessary work.

As a point of awareness for the reader, it may be helpful to acknowledge that decisions about backup power are influenced by personal considerations for possible weather conditions, the severity and expected lengths of an outage, personal coping limitations and access to alternatives such as relocating to a cottage, visits with friends or family, or making use of restaurants and hotels.

1. Determining Power Needs

For some people, it might be helpful to understand a little bit about electricity which is measured in volts, amps, and watts. A good analogy is comparing it to water; voltage is the pressure in a hose, amps is how wide the hose is and watts is consumption (filling up a bucket with a hose). Your electricity provider bills you in kilowatt hours (kwh) = 1,000 watts being consumed for one hour. For example, a 100-watt incandescent light bulb left on for 10 hours consumes 1,000 watts (1 kwh) of electricity. Ottawa Hydro's current Time of Use prices range from 7.4 to 15.1 cents per kwh.

To determine your needs, you'll need to know what the power consumption is for each of the devices you want to be powered, and that some devices consume more power while starting up than while running (typically those with electric motors). These values are normally printed on a label somewhere on the device or in the literature that accompanied it, or a best guess based on similar devices or from the table below. It's simply a task of adding up these values to determine the type and size of power supply required.

	Typical Wattage			Typical Wattage	
Device	**Min**	**Max**	**Device**	**Min**	**Max**
Air Conditioner – central	1,500	4,500	Garage Door Opener	875	1,200
Air Conditioner – window	1,200	3,600	Home Phone	3	5
Charger (Cell Phone)	7	10	Internet Wi-fi Router	5	10
Charger (Tablet)	10	15	Electric Kettle	900	1,200
Coffee Maker	500	800	Light Bulb (Fluorescent)	20	25
Computer (Desktop)	100	350	Light Bulb (Incandescent)	60	100
Computer (Laptop)	40	50	Light Bulb (LED)	6	10
CPAP Machine	60	90	Microwave	750	1,200
Deep Freeze	500	1500	Printer (Inkjet, not laser)	20	30
Dishwasher	1200	1500	Range Hood	20	35
Dryer	5,400	6,750	Refrigerator	700	2,200
Electric Blanket	80	1,250	Security System	100	500
Electric Doorbell	2	3	Space Heater	750	1,800
Electric Stove	2,100	3,500	Sump Pump (1/2 HP)	1,050	2,150
Electric Water Heater	2,500	4,000	Television (32" / 64" LED)	40	100
Fan (Ceiling)	60	70	Toaster	850	1,250
Fan (Pedestal)	40	60	Washing Machine	1150	2,250
Furnace (Gas)	700	1,400	~~Water Pump~~ Do NOT configure*	~~500~~	~~1,500~~

*NOTE: Specific to PAP, the pump for your household water system should not be configured to run on backup power. The reason for this is that during a power outage, the pumps of PAPs septic system won't be operating which puts the holding tanks at risk of overfilling. The cost of having a tanker truck come to PAP and pump out the holding tank is about $8,000 and if there is an overflow, the environmental cleanup costs can easily exceed $25,000 and force additional ongoing overhead costs on PAP for stricter report submissions. These costs are shared equally by all PAP owners. In the event of an extended outage where owners may run out of water, an alternate solution may be available and you will be advised of such by your board of directors.

2. **Stationary Generators**

These are the professionally designed and installed turnkey "Generac" types of solutions where the generator is in a permanent location and integrated into a home's electrical wiring. Physical size is about 3 x 5 ft x 30 inches tall and requires about 18 inches perimeter clearance. Specific to PAP, these can be located only in the exclusive use area at the rear of a home and require prior approval from the board.

What can be powered: An entire home or selected portions. Pumps for household water systems should NOT be configured with backup power.

Power Source: Home's supply of propane.

Power Output: 120/220 VAC at 6,000 watts and higher for indefinite periods of time.

Owner requirements: No special knowledge, skills, tools, or physical capabilities required.

Pros: Minimal decision making, fully automated, no owner intervention required.

Cons: Costly to purchase, install, maintain, and repair. Routine maintenance by the supplier can be required, usually as a requirement for warranty coverage.

Cost: From $10K to $50K or higher. Their lifespan is typically at least 15 years.

3. **Battery Inverters**

Also known as Portable Power Stations. Physical sizes range from lunch boxes to large suitcases and weigh from 5 lbs to 100+ lbs.

What can be powered: Best suited for smaller devices such as electronics and lighting. It's noteworthy that garage door openers can be purchased with a built-in backup battery and that a dedicated battery inverter for an existing garage door opener is feasible.

Power Source: Charged by household AC power when available and generators or automobiles if available. Solar is an option, but recharging would be unreliably slow.

Power Output: 120 VAC at 200 watts to 1,500 watts. Many have USB ports for charging electronic devices such as cell phones. Smaller ones can power small devices for a few hours or less, larger ones can power many small devices or a single larger device for several hours.

Owner requirements: No special knowledge, skills, tools, or physical capabilities required except the heavier units could be difficult to move for some people.

Pros: Simple to use, smaller ones are easy to move around. Can be left plugged in to an AC outlet so they're always fully charged. They can also serve as an uninterruptable power supply (UPS) for critical or sensitive electronic and medical devices or as a backup to a device such as a garage door opener.

Cons: Only the largest units powering small devices will operate for more than a few hours. Weight increases with power output/watts. Must be routinely or kept fully charged to be of any use during a power outage.

Cost: Prices can range considerably by supplier and quality, but a typical mid-range purchase cost of a unit is about $1.00 per watt. Life spans vary but lower quality ones can be expected to last 3 years or longer and higher quality ones for 10 years or more.

4. **Portable Generators**

Numerous variants available for size, output and fuel types. These can be stored in a garage or an outdoor shed and must be moved to an outdoor area to operate. In the simplest configuration, extension cords are used to power multiple devices inside the home. More complex configurations can be a partial or full integration into a home's electrical wiring to supplement or replace extension cords. Sizes range from a small sports bag to a large suitcase with wheels. Weights range from 10 to 100+ lbs. Specific to PAP, no board approval is required to store or operate these. However, prior board approval is required if they're to be located on common property such along the wall where your electrical meter is located.

What can be powered: Multiple small to mid-sized devices, including lights, electronics, TVs, refrigerators, freezers, fans, space heaters, etc. Wiring modification would be required for hard wired devices such as furnaces or sump pumps. Wiring modifications can also be done for the sake of operating convenience. Not suitable for power hungry devices such as ranges, clothes dryers, air conditioners or water heaters. Pumps for household water systems should NOT be configured with backup power.

Power Source: You have a choice; gasoline or propane. Some units are dual fuel. The storage life of regular gas with ethanol is 3 months and up to 6 months for non-ethanol gas. Stabilizers might double the storage life. Refilling can be messy and storage of more than 100 litres in a single area is considered dangerous. Propane can be stored indefinitely in portable tanks, or you can have a quick connect outlet installed from your existing propane system (est. $250). This can be cheaper and more convenient but might not be suitable for your intended operating location.

Power Output: You have a choice; regular or inverter. Compared to regular types, inverters are quieter, less costly to operate (fuel consumption), typically smaller and lighter, and suitable for all devices including sensitive electronic devices such as computers. Regular types can produce slightly more power, can be more reliable and have slightly lower purchase and repair costs but may not be suitable for all electronic devices due to output fluctuations. Smaller units produce 120VAC at 1,000 watts and higher. Larger units produce 120 VAC or 120/220 VAC with 3,500 to 4,500 watts commonly used for basic residential applications. Many also have USB ports. In addition to a pull cord for starting, some models have an internal battery for electric starting. Some also have a remote start option but these may not work during a power outage if it requires a wireless network component that's dependent on household power. Run time on a tank of fuel typically ranges from 5 to 20 hours with the amount of power being consumed being a factor. Most manufacturers suggest shutting them off after 10 hours to cool down and check oil levels.

Owner requirements: For basic configurations with a small generator, no special knowledge, skills, tools, or physical capabilities are required. Some people may have difficulty moving the larger units as well as any 20 lb propane tanks (weigh about 35 lbs when full) or larger gas containers (5 gallon/20 litres weighs about 30 lbs). For more complex configurations with wiring modifications, special knowledge, skills, and tools are required to complete an installation but only minimal knowledge is required to operate.

Pros: Many configurations are possible to match needs, budget, and capabilities.

Cons: Outdoor storage can have challenges, such as accessing with heavy snowfalls and risk of theft unless precautions taken. Refilling gas tanks can be difficult for some people and there's a risk of spillage. Setting up for operation and returning to storage can be time consuming.

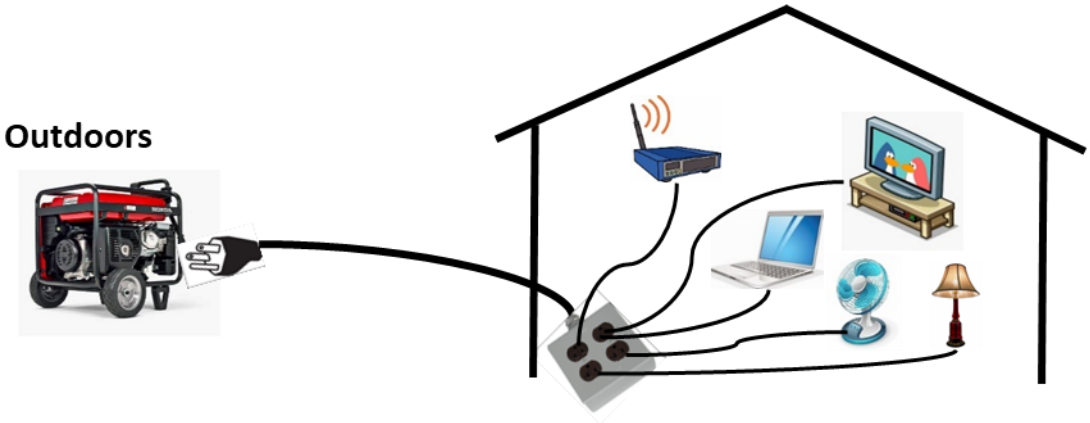
Cost: Prices vary with low power, low quality types costing about $250+ and higher power, higher quality costing $1,000 and up. Wiring configurations can be less than $100 (extension cords or electrical parts) and $500+ for modifications to household wiring. Their lifespans are typically 5 to 10 years or longer.

5. **Wiring Configurations**

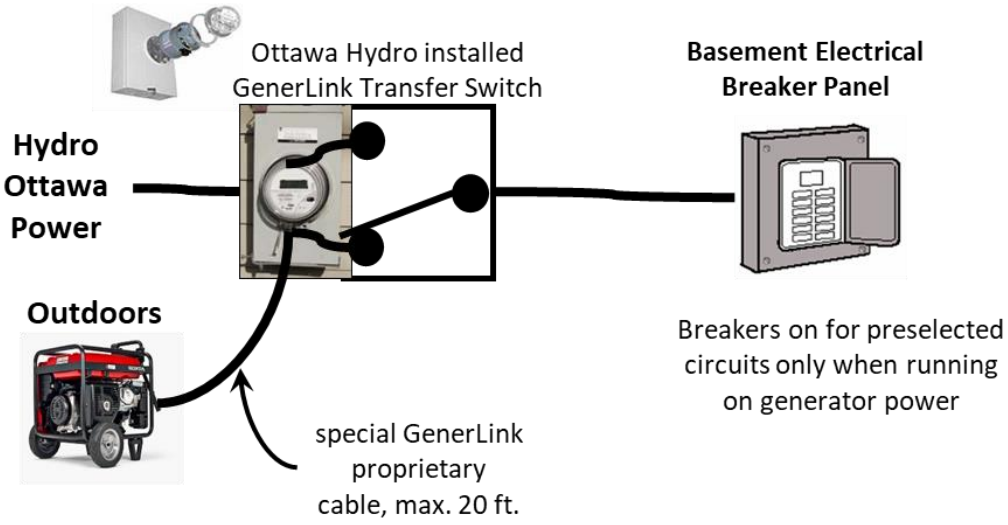
There are many possibilities, from simple to very complex. The following are applicable only to battery inverters and portable generators. Combinations of the examples below can create a solution specific to your needs or as part of a longer-term goal.

A. **<u>Easiest:</u>** This is where one or more battery inverters are used to power one or several devices.

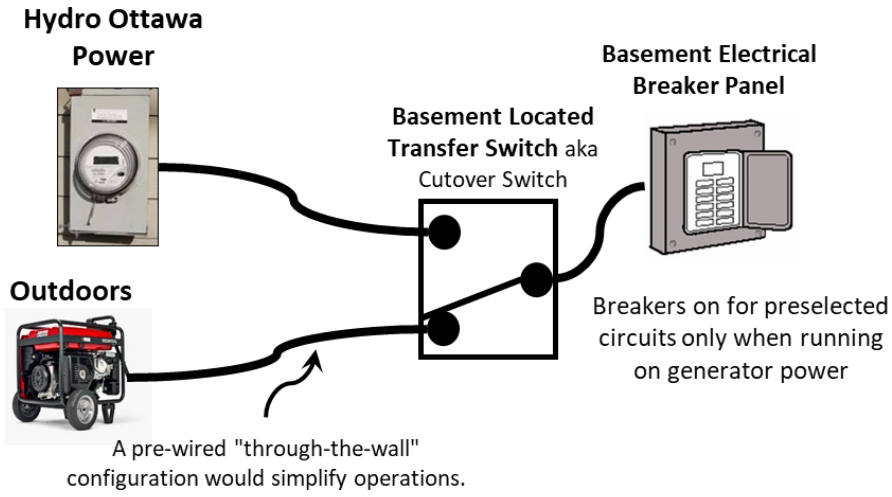
B. **<u>Easy:</u>** This is using a portable generator with multiple extension cords to power multiple devices. Using it requires getting access to it, moving it to an operating location and running the extension cords. Heavy duty cords should be used which can cost $50+ each.



C. **<u>Easy but costly</u> and possibly more suitable for some homes:** This is "easy" with having Hydro Ottawa install a "GenerLink" brand transfer switch located between their electrical meter and your home electrical wiring. During a power failure, it will switch off the main feed that normally powers your home. This will allow you to connect your generator output to the input plug on the switch that will power some preselected circuits/devices in your home. Before powering up your generator, certain breakers in your electrical panel must be turned off, which is predetermined based on what you want to be powered and what your generator is capable of. The retail cost of a GenerLink switch is about $1,800. Charges from Hydro Ottawa are unknown but could be in the range of $500.

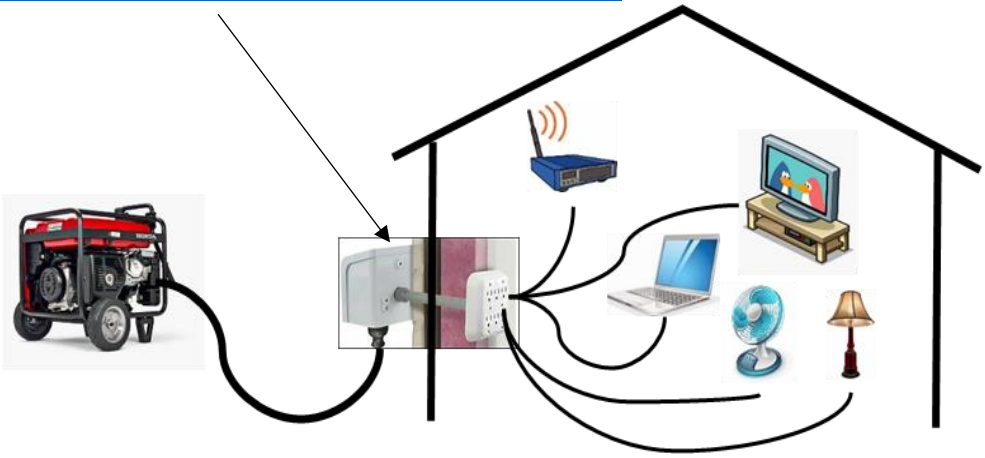


D. **<u>Easy but possibly less costly</u> and more suitable for some homes:** This is a variant of the GenerLink noted above, where a manually operated transfer switch is installed in the basement beside the breaker panel. As with the GenerLink transfer switch, this is "easy" as it should be done by an electrician with the proper permits and inspections. The cost of transfer switches ranges from $250 to $1,500 and higher. The cost of an electrician to install these could be in the range of $250 and higher.

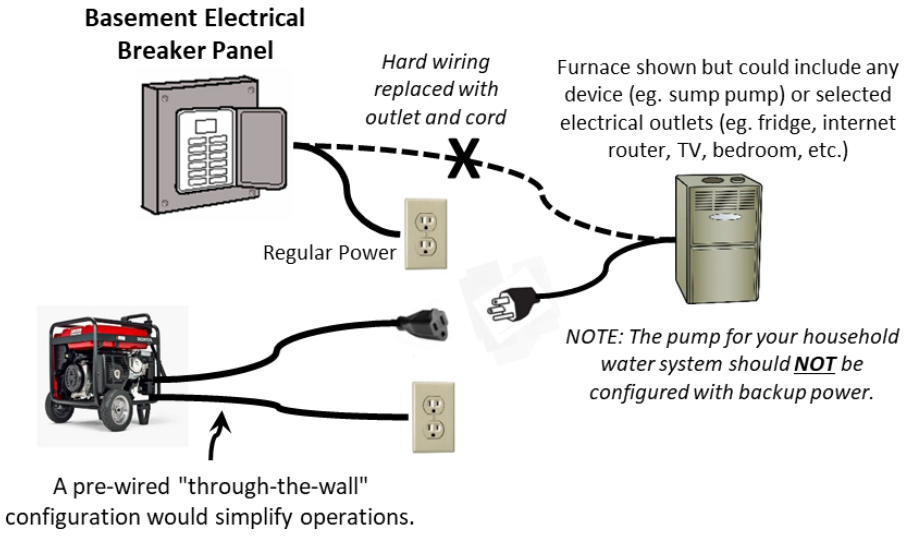


E. Moderately Difficult: This is using a portable generator making use of a "through-the- wall" plug (available as a kit for $125-$170 or assembled from piece parts at a lower cost) and using extension cords within the house. Requires basic DIY skills and tools.

Kit examples from Amazon (check other retailers too);
https://www.amazon.ca/King-Canada-K-X7500-Generator-Connection/dp/B09ZGSRHQC/ref=sr_1_9?crid=3LM5NK9B5H1CJ&keywords=generator+through+the+wall+plug&qid=1677615712&sprefix=generator+through+the+wall+plug%2Caps%2C134&sr=8-9
or
https://www.amazon.ca/Reliance-Controls-WKPBN30-Portable-Generator/dp/B0743BQDT4/ref=sr_1_8?crid=3LM5NK9B5H1CJ&keywords=generator%2Bthrough%2Bthe%2Bwall%2Bplug&qid=1677615712&sprefix=generator%2Bthrough%2Bthe%2Bwall%2Bplug%2Caps%2C134&sr=8-8&th=1



F. Difficult: This is converting hard wired devices to a plug-in. A device is unplugged from the regular power outlet during a power failure and plugged into the outlet powered by the generator. The Ontario Electrical Safety Authority approves this for certain devices such as furnaces and sump pumps. See following pages or visit this link;
https://esasafe.com/assets/files/esasafe/pdf/Electrical_Safety_Products/Flash_Notices/22-27-FL.pdf
Note: Instead of plugs, using a manual transfer switch (aka changeover switch) for each circuit is technically possible (a standard 3-way switch is NOT) but it appears to be not permitted by the electrical code. A certified electrician could confirm.



FLASH

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Flash 22-27-FL
Supersedes 19-27-FL

Use of temporary portable generators

Background:

Over 250,000 customers in Ontario lost electrical power as a result of the ice storm that hit Southern Ontario in December 2013. During this distressed time, the Electrical Safety Authority (ESA) noticed impulsive actions taken by some home owners trying to alter electrical installations to supply essential loads with portable generators which might have caused electrical fires and shock hazards to both building occupants and Utility workers.

Direction:

It is permitted to use portable generators without the use of a transfer device, provided there is no possibility to backfeed to utility lines. It is of the utmost importance that the end users closely follow installation and operating instructions supplied by the portable generator manufacturer to minimize potential hazard of electrical shock or fire.

Temporary connection using plug-cord set:

- Where an extension cord is used to plug into an appliance or other device, no live parts shall be exposed when one end is connected to a source of supply and the other end is free.
- The Ontario Electrical Safety Code (OESC) does not prohibit appliances, which are intended for connection by a wiring method as specified in Section 12, to be cord-connected using an attachment plug and receptacle.
- Consideration shall be given to correct configuration of male-plug to be used, as per Diagram F1, as well as the cord set, in terms of number of conductors, ampacity and voltage rating.
- In preparation of such setup during a power failure, conductors must be treated as “LIVE” to avoid shock hazard if the main power returns. Ensure panel directory is up to date and if in doubt, shut the main disconnect off.

Other tips to ensure you're using portable generators safely are:

- Never use a generator indoors; use it in a dry area outdoors and away from open doors, windows and vents.
- Never connect portable generators to electrical appliances or wiring components that have been affected by flood water.
- If you have to use extension cords, make sure they are the grounded type with three prongs and rated for how you're planning to use them. Coiled cords can get extremely hot; always uncoil cords and lay them flat.
- Gasoline and its vapors are extremely flammable. Allow the generator engine to cool at least 2 minutes before refueling and always use fresh gasoline.

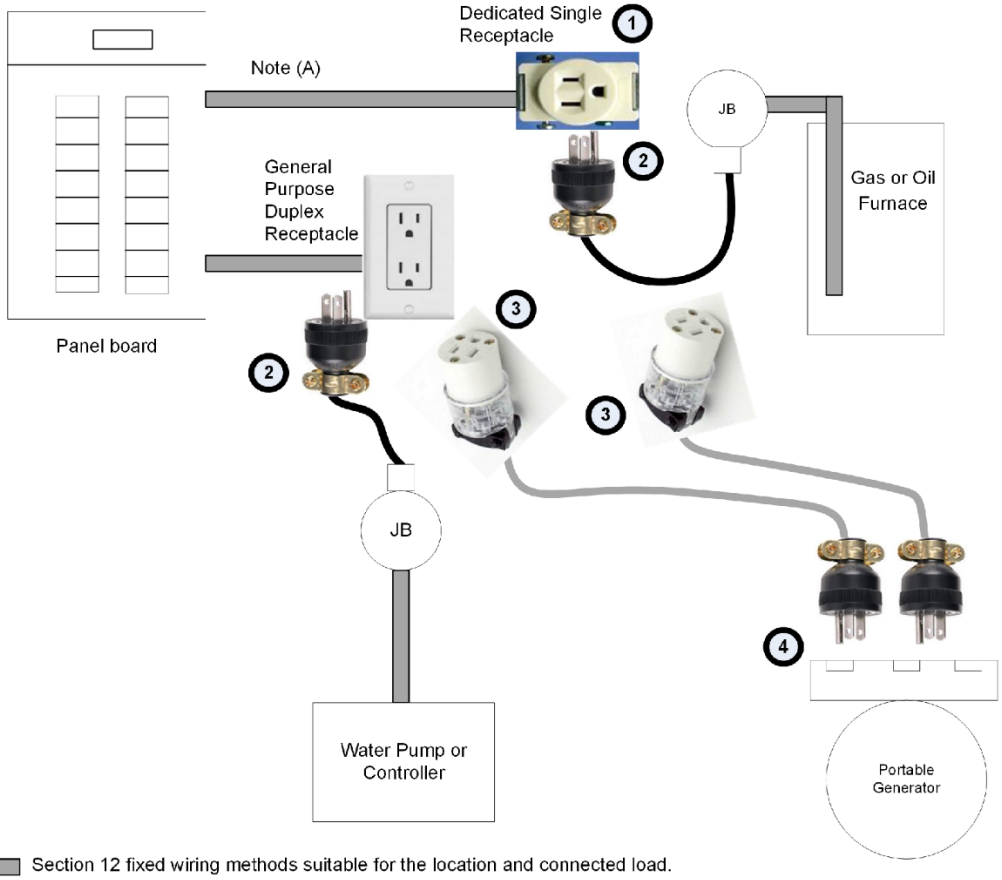
For more information on electrical safety when stormy weather hits, visit:

https://esasafe.com/safety/

As normal power is restored, temporary generators shall be disconnected and all temporary wiring removed. ESA strongly advises customers to have equipment and wiring (that were disturbed to allow the temporary connection to the generator) checked and repaired as necessary to ensure restoration to safe operating conditions.

Diagram F1 provides guidance to the correct use of portable power generators

Diagram F1 – Temporary setup for portable generator



Section 12 fixed wiring methods suitable for the location and connected load.

Extra hard usage flex cord of not less than No. 14 AWG, correct number of conductors, ampacity and voltage rating for the application and to ensure bonding. Suitable for the location (wet or dry).

Portable outdoor cordsets with one male plug and one female cord cap. Consideration shall be given for correct configuration, number of conductors, ampacity, and voltage rating.

1. Single Receptacle located at least 1.5 m above floor (Rule 26-802), and as close as possible to furnace to minimize flexible cord run. Plug/cord set and receptacle satisfy disconnecting means requirements, Rule 26-806 5).
2. Male Plug to match receptacles
3. Female cord cap to match plug 2
4. Portable generator interface, depends on make and model of generator (receptacles, fuses, switches, etc.)

Note (A):
The installation of a permanent single receptacle fed from service panel to supply cord connected furnace needs to satisfy all code requirements and requires the application for inspection.

CAUTION:
- Disconnect overcurrent protection (shut off branch circuit breaker, or unplug the fuse) feeding hard-wired appliance, before attempting to do any alteration to their wiring;

- Ensure you read the nameplate for the appliance and select the plug and cord set according to appliance amperage, voltage and phase. For 120V appliances, use 3-prong plugs and cord sets to ensure proper bonding;

- Use certified electrical products. Unsafe products may pose fire and electrical shock hazard.