

# Emergency Preparedness Information

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## OBJECTIVE

Our objective was to develop information regarding various home systems that are normally in the background of our everyday lives and only come into play in extraordinary circumstances. Many of these systems require periodic attention to ensure they're ready when needed.

In today's distribution we are addressing:

- **DRAINAGE** (how to minimize the burden on your sump),
- **SUMP SYSTEMS** (maintenance requirements and available back-up systems),  
and
- **GENERATORS** (both portable and permanent).

We are not recommending any particular solution or any particular products but merely trying to improve understanding and to provide examples.

Our long-term objective is to create an HOA Emergency Management Plan that identifies individuals, resources and event triggers. Stuff happens; hurricanes and winter ice storms causing power outages may occur in our future and could even be of much longer duration. Identification of both external and HOA resources can significantly enhance our community's ability to cope with the unusual.

## PERSPECTIVE

The difficulties many of us recently encountered with Irene may never happen again. We are unlikely (despite global climate change) to again experience the confluence of pre-saturated ground, heavy rain and a lengthy power outage. August rain was historic, making Irene's impact historic.

Insurance of any kind is a gamble -- whether the insurance is a financial product like a homeowners insurance rider or a capital asset, such as a backup system, we invest in. Although the odds for almost all insurance, financial or capital, are not in the consumer's favor, there is also the difficult-to-quantify emotional security afforded by the insurance. The insurance riders or backup systems you may consider adding will probably not return your investment -- but may allow you to feel less worry.

## INSURANCE

Nancy Carey volunteered to try to sort out the offerings of the various insurance companies (and agents within those companies). It appears that coverage for basement flooding is quite a hodgepodge.

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Very few companies cover basement flooding resulting from failure of a sump system without a specific rider. (One exception is USAA.) Some companies (State Farm and Liberty Mutual) who offered riders in the past are now reportedly declining to write them. Some riders cover only heaters, “basement” appliances washers and dryers), and structural damage (e.g. replacing wet wallboard). Some coverage includes wall-to-wall carpeting but no other furnishings. Most companies appear to cap these riders at \$10,000. (Erie and Nationwide offer higher coverage amounts.)

We can only suggest that you shop around, and that you carefully examine the endorsement wording for the coverage you’re considering.

### COMMUNITY

The best “insurance” for any calamity is a caring community. **If you need help, ask for it** – most of your neighbors are more than ready to pitch in. If you don’t feel comfortable “managing” some of the technologies we’re confronted with, **ask a neighbor who is more technologically adept for assistance**. If you’re going to be out of town, let your neighbors know and instruct them on whatever attention your home might require if a situation arises in your absence.

# Drainage

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The more water can be moved away from the foundation, the less may find its way to the sump (and basement).

Water flows that can be managed include:

- water from downspouts
- water into exit stairs or wells
- sump water itself.

## **DOWNSPOUTS**

Try to observe the flow near all your downspouts during a heavy rain. (Does the water flow at least 5 feet away from the foundation?)

Splash blocks should be well-positioned to deflect heavy rain away from the foundation. If there is erosion at the end of a splash block, some heavy stone (on the splash block) will help.

The terrain onto which the splash block directs the water should be sloped away from the house. If the terrain is not sloped adequately, you may want to consider adding a buried extension leading to a pop-up, or where appropriate, a surface flexible extension. Either addition requires approval from the Association's Architectural Committee – to ensure that the change does not adversely affect your neighbors.

For temporary relief from an expected deluge you could keep on hand one or more 8' to 10' coils of black 4" corrugated pipe that you could attach to any of your less-effective downspouts to better convey the water away from your foundation. Note the emphasis on temporary – they are ugly and cannot be placed permanently (unless buried -- with approval).

## **EXITS**

In general, the drains at the bottom of stairs and wells lead to the sump. Thus any water that can be diverted will lessen the load on your sump pump.

Shed covers probably function best.

Dome covers work also, but be sure to place the channel along the one side of the dome against the house.

# Drainage

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## **SUMP DISCHARGE**

It is against municipal code to discharge sump pump effluent into the home (sanitary) sewer system.

Ideally the sump pump outflow pipe should extend a minimum distance of 7 to 10 feet from the home so as to avoid having the water flow back into the drain/tile field surrounding the home, and thus back into the sump.

Ideally the minimum downslope for a 10 foot discharge pipe should be 6 inches down – allowing gravity to keep the water flow moving and reduce the likelihood of (water) freezing (in the discharge pipe). A discharge pipe that is not angled down sufficiently can freeze. If adequate pitch isn't achievable you might consider adding a Y along the down pipe to provide relief (the Y should be angled up and have a flapper to keep animals and debris from entering). There are ice-preventing devices for discharge pipes – IceGuard being one example.

There should be very few bends or elbows in the draining pipe.

You might consider using "flex pipe" for an extension, so the outflow can be moved to prevent continued erosion or continual wetness in one area and to allow the pipe to be easily moved when lawns are mowed.

Perforated pipe might also be used as the sump pipe extension to spread out the water flow and avoid erosion problems.

Any change or addition to the sump pump discharge pipe must be approved by the Architectural Committee.

## **GREEN CONSIDERATIONS**

Some suggest creating a "rain garden" where the sump (or gutter/downspout) outflow aims. A rain garden is a place where a small berm/dam is constructed and bog type plants are placed to naturally absorb the excess water. In some RAP homes this can easily be added to existing rear plantings (with Architectural Committee approval).

If the grade is steep enough, some suggest collecting sump water (and/or gutter/downspout flow) in rain barrels to recycle the water for garden plantings (again, with AC approval, and as long as the devices are hidden from view).

# Sump Pumps

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Note: The models of pumps listed in this report are shown ONLY for comparison and price range and their listing should NOT be taken as a recommendation or ranking of quality; these are guidelines ONLY, offering information for your consideration."

Homes with finished basements, or valuable storage in their basements, should consider having a battery-powered backup pump. If your sump pump runs frequently, even a short power outage can result in flooding.

- Sump pumps require periodic maintenance to remain reliable.
- Fully charged batteries generally can run a backup pump for approximately 4 hours if they are required to run constantly.
- Backup sump pumps are not only protection against power outage; sump pump failure can also occur.
- A typical submerged sump pump will last from 5 to 25 years depending on use and maintenance.

There are a number of types of sump pumps. Each has advantages and disadvantages. They come in various sizes allowing for different gallon per hour pumping capacity. The rise (distance from bottom of sump pit to discharge pipe exit) will affect the pumping capacity and should be taken into consideration in the selection of a primary or backup pump. Prices for primary and backup pumps can range from under \$100 to well over \$1,000.

**Primary sump pumps** – There are two basic types of pumps – submersible and pedestal.

**Submersible sump pumps** are fully submerged under the water in the sump pit.

## **Selection**

There are a number of models available on-line or at Lowes and Home Depot.

The following should be considered when purchasing:

- They should be constructed of non-corrosive material for longer lasting service such as epoxy coated cast iron, stainless steel, etc.
- Capacity – a 1/3 hp pump will typically have a pumping capacity of 2760 gal per hour at a 10 foot rise, a 1/2 hp pump will have a pumping capacity of 4980 gal per hour.

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- They require a check valve to prevent the water in the pipe from draining back into the pit.
- Electric cord length - sump pumps should be plugged directly into a GFI outlet.

## Advantages

- Submersible pumps are quieter than pedestal pumps.
- They are more reliable and depending on pumping time can last from 5 to 25 years.
- They are safer since they are located under the sump pump cover.

## Disadvantages

- Submersible pumps are more expensive than pedestal pumps.
- They must be removed from the pit to perform routine maintenance.

## Some popular brands

- RIDGID 1/2 HP Submersible Sump Pump. The RIDGID 1/2 HP Submersible Sump Pump pumps at 4,400 GPH at 0 ft. of rise or 3,200 GPH at 10 ft. of rise. The pump's stainless-steel motor housing and fasteners and its cast-iron impeller and pump housing offer protection from corrosion and abrasion. \$179 at Home Depot.
- RIDGID 1/3 HP Submersible Sump Pump With stainless steel and cast-iron construction for optimal abrasion resistance, the RIDGID 1/3 HP Submersible Sump Pump provides a maximum pumping capacity of 3,100 gallons per hour. The unit features a diaphragm switch and a top-suction intake that filters debris to provide performance reliability. \$149 at Home Depot.
- Little Giant 506158 Big John 1/3 HP 2760 GPH Submersible Sump Pump with Integral Diaphragm Switch and 8ft. Cord. \$120 on-line.
- Little Giant 510156 Big John 1/2 HP 4980 GPH Submersible Sump Pump with Integral Diaphragm Switch and 25ft. \$362 on-line.

**Pedestal sump pumps** are mounted above the sump pit and are not built to get wet. They are generally cheaper than a submersible pump but are a lot noisier than a submersible. These are typically used if the sump pit is too small to handle

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the submersible pump.

## Selection

- Same criteria as submersible but do not require non-corrosive material since they remain above the water.

## Advantages

- They are easier to maintain.
- They are cheaper since the pump is not under water

## Disadvantages

- They are noisier since they are not under water.
- They can be a danger to children if they are accessible.

## Some popular brands

- RIDGID 1/2 HP Pedestal Sump Pump
  - The design of the RIDGID 1/2 HP Pedestal Sump Pump offers replacement of most existing pumps with no plumbing changes.
  - Pumps 4,100 GPH at 0 ft. of rise, 2,400 GPH at 10 ft. of rise and 1,380 GPH at 15 ft. of rise.
  - It features a discharge of 1-1/2 in. for high flows, and the top-suction intake filters debris for reliability.
  - \$169 at Home Depot.
- Flotec 1/3 HP Pedestal Sump Pump
  - -The Flotec 1/3 HP Economy Pedestal Sump Pump is designed to replace an existing 1/3 HP pedestal pump.
  - This powerful pump moves 2,460 GPH at 10 ft. of lift.
  - This ADA Compliant sump pump is made of a non-corrosive thermoplastic resin for added durability.
  - This 1/3 HP sump pump fits into a 12 in. diameter or larger sump pit and has a 1-1/2 in. discharge.
  - \$78 at Home Depot

**Sump pump maintenance** – Sump pumps like all mechanical equipment require periodic maintenance.

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- Sump pump pits should be kept free from debris or other items that can interfere with the operation of the float and pump.
- If the pump switch is the diaphragm type, it should be tested by filling the pit above the pump to assure that it functions correctly. Floats can be manually engaged by lifting it by hand.
- Sump pumps have a screen filter on the intake, either the bottom of the pump for submersible or the bottom of the intake pipe for pedestal pumps, these can become clogged with mud and dirt and if not cleaned periodically (recommended once per year) the pump will lose pumping capacity and eventually fail.

**Backup sump pumps** – these pumps are usually submersible and can be battery (12 volt powered) or water powered. They are intended to pick up the load if the primary pump fails. There are a number of models and sizes available on-line or at the local Lowes or Home Depot.

## **Battery powered pumps**

### **Selection**

- The pumps are rated for gallon per hour capacity at a ten foot rise, choose one that will adequately provide backup to your primary pump’
- The backup kits generally do not include a battery, it must be purchased separately. The battery should be a marine type. These batteries are designed to discharge completely without damaging the battery. Some models **require** proprietary batteries to use all the features monitored by the control box. There are different types of marine batteries ranging from \$99 to over \$400. (see website - <http://www.sumpumpsdirect.com/pumps/sump-pump-batteries.html>) A RAP resident purchased 4 at Boatworks by Roman in Norristown at 1920 W. Marshall Street. Roman got them the day after he called when they couldn't be found anywhere else. The phone number is 610-539-8989. They cost \$114.95 a piece.
- They will also have a trickle (slow) charger connected to recharge after use. Depending on run time, they will run for four hours to over 12 hours depending on run pump cycle time. They typically have a control box that



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has warning alarms and lights to alert you to the condition of the battery (charge level and battery water level) and whether the pump was required since last checked.

- They will require a check valve. This prevents the water in the discharge pipe from dropping back into the sump pit causing unnecessary cycling.
- 2 batteries can be connected in parallel to effectively double battery life.
- There are battery backup pumps that also run on electricity. This can be useful if the primary pump fails but comes with an increased cost.

## **Advantages**

- They come with directions and can be installed with minimal PVC plumbing skills.
- They connect into the existing discharge pipe.
- They also provide backup if the primary pump fails.

## **Disadvantages**

- They require space in the sump pump pit since they are submersible. They have an external float valve that must be kept clear of obstruction.
- If they are required to run continuously the battery might not last for more than four hours.
- Batteries lose power even when not used.
- An automobile battery can be used in an emergency situation but discharging this type of battery can ruin it and it may no longer be useable in the car. This replacement cost is much lower than repairing a flooded basement.

## **Maintenance**

- The pumps require the same maintenance as the primary pump.
- Press the test button at least once per month to make sure the pump is ready to operate. Since the battery and pump need to be in good working order, you may want to perform a test after a good rain and the primary pump is pumping. Unplug the primary pump and watch to make sure the

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battery backup steps up. Having a good battery and a malfunctioning pump is not a good situation.

- Batteries must be checked for water level. If low (1 inch below the cap level) add distilled water only. At a minimum check the water level once a month. Don't rely on the pump control system to tell you when to add water. These are prone to failure. Some batteries are gel filled and/or sealed, these do not require maintenance but should still be checked by a professional for remaining life.
- The battery should be replaced at least every five years.

## **Some popular brands**

- Basement Watchdog Emergency Battery Backup Sump Pump
  - Pumps 2,000 GPH at 0 ft. of rise or 1,000 GPH at 10 ft. of rise.
  - This convenient pump fits next to the primary pump and automatically begins pumping during power outages, when the primary pump fails or when water flow exceeds the capacity of the primary pump.
  - Its unique monitoring system sounds an alarm when maintenance is needed or a problem arises. A display panel indicator light will identify the cause of the alarm and the proper corrective action.
  - \$138 at Home Depot, battery extra.
- Basement Watchdog Special Battery Backup Sump Pump System
  - Pumps 2,500 GPH at 0 ft. of rise and 1,730 GPH at 10 ft. of rise. Pumping begins automatically during a power outage, when your primary pump fails or when the water flow exceeds your primary pump's capacity.
  - The backup pump's monitoring system sounds an alarm when maintenance is needed or when a problem arises. A light on the display panel will indicate the cause of the alarm and the proper corrective action.

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- \$246 at Home Depot, battery extra.

## **Water powered back up pumps**

In a water driven sump pump, household water flows through a venturi, creating a “vacuum” that draws water from the sump pit. The household water and the sump water are then discharged outside the house.

By nature of its design, household water and sump water come together in the body of a water-driven sump pump. Due to the possibility of contamination of the household water, manufacturers are required to include a backflow prevention device in the pump. As an additional safety factor, some municipal codes also require that the installation include an additional device to prevent cross-contamination.

There are basically two configurations of these pumps: one that installs in the sump pit and one that installs near the ceiling. Most of the literature recommends against using a pump that installs in the pit to lessen the danger of cross-contamination, since the pump is often submerged in sump water.

Before considering the installation of a water driven sump pump, the homeowner needs to insure that there is adequate household water pressure available to drive the pump. These pumps are powered by the water pressure in your home water supply. They require at least 40 psi to 100 psi to operate properly. The better models are designed to use 1 gallon of water to remove two gallons of water from the sump pit. They can be expensive to run for long periods of time but are not dependant on the availability of electric power. RAP homes are connected to a reliable water supply. Consideration of the additional water discharge should be made so as not to cause problems for your neighbor’s drainage. Installation is typically more expensive in that it is best to run a ¾ inch water pipe from the water line close to the meter to provide the best pumping capacity. This is further complicated if you have a finished basement. If you are away from the house for extended periods and turn off the water, this pipe must be connected before the shutoff valve or the pump cannot work. If your water pressure is good (40 -60 psi) at the nearest water supply, for example an outside faucet, you may be able to save on installation charges by using this connection. Just keep in mind the amount of water that you will be expecting this pump to handle. This type of pump generally requires the services of a licensed plumber.

### **Advantages**

- The literature is in fairly unanimous agreement that the key advantage is that the source of power for the pump – household water – is always available. Operation of the pump is not affected by power failures or dead batteries.

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- If your sump pump rarely runs, has a small volume of water to move when it does run, and your home has municipal supplied water with good pressure, the water powered sump pump will save you money and worry since there are no moving parts and no battery or charger to be concerned about
- The water powered sump pump should last longer than the battery or primary sump pump especially the ones that are installed out of the pit above the primary sump pumps.

## Disadvantages

- The pumps will not work with water pressure less than 40 psi.
- The published discharge rates are based on optimum household water pressure and a rise of ten feet. Lower pressures or higher rises will decrease the efficiency of the pump. If your pump is very active and must move a lot of water, a water powered sump pump will not keep up with the demand.
- At less than 40 psi, you will continue to consume public water which may go into the sump, out the outlet pipe or some combination thereof.
- If the sensor fails, you will continue to pump out public water until you hear it flowing or see the discharge in your yard.
- Since the supply line must be run from the water entry point near the front of the house to the sump pit located at the rear of the house, getting the rigid pipe through the walls or ceiling of an already-finished basement carries additional expense.
- The amount of water being discharged to the ground near the house is generally at least double the amount of sump water that's being removed. Depending on water pressure, rise and pump design, the total amount of water being discharged can easily become three times the amount of sump water. This serves to further saturate the ground that is surrounding the house and adjacent houses. Discharging the water to the sanitary sewer to

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mitigate this situation is not an option, since most municipalities – including Montgomery County – prohibit this practice.

- All municipalities have requirements concerning cross-contamination, and the installer must be thoroughly familiar with these requirements. This factor, coupled with the need to run a water supply line through the basement, takes installation out of the do-it-yourself category for most people.
- From a “green” perspective, use of these pumps is considered to be a significant and unnecessary waste of treated drinking water, for this reason, many groups and organizations have come out in strong opposition to their use, and some municipalities have banned their use.

## Some of the top rated models

- **The Basepump RB-750**
  - Rated “Residential”, and mounts in the ceiling of the basement.
  - With the required backflow preventer installed, the pump removes **750 GPH** at 50 psi with a 10 foot head (rise) and a ¾” supply line.
  - The manufacturer states that under ideal conditions, the pump will use one gallon of fresh water to remove two gallons of sump water.
  - The price for this pump is \$299 depending upon where you buy it.
- **The Basepump HB-1000**
  - Rated “Residential/Commercial) and mounts in the ceiling of the basement.
  - The Basepump HB1000 water powered sump pump has the highest pumping rate of the four best sellers. With the required backflow preventer installed, the pump removes **1,000 GPH** at 50 psi with a 10 foot head(rise) and a ¾” supply line.
  - The manufacturer states that under ideal conditions, the pump will use one gallon of fresh water to remove two gallons of sump water.
  - The price for this pump is around \$359 depending upon where you buy it.

The two pumps below provide very modest capacity (only 25% to 50% of a battery-powered backup pump, and only 10% of a primary sump pump). They may not be adequate for sumps with substantial flow.

- **The Wayne EWP-10**

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- Rated at **312 GPH** with a 10 foot head (rise). No additional details on output are provided.
- The pump is mounted in the sump pit.
- The price range for this pump is \$139 to \$174 depending upon where you buy them.
  
- **The Zoeller 502-0005**
  - Rated at **251 – 493 GPH** with a 10 foot head (rise) and a  $\frac{3}{4}$ " supply line. The lower rate is the ideal rate obtained with a 40 psi supply pressure. The higher rate is the ideal rate obtained with an 80 psi pressure.
  - The pump is mounted in the sump pit.
  - The price for this pump is around \$199.00 upon where you buy it

# Generators

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One way to provide electrical power to critical devices in your home during an outage is to use your own generator. These self-contained units can supply regular AC house current to a number of devices, depending on the electrical capacity of the generator, which can range from about 800 Watts for portable generators on the low end, up to 20 kW and higher for permanently installed home units on the high end. A Watt is a unit of electrical energy which occurs when a current of 1 amp is passed thru a load, at a voltage of 1 volt. Thus, you would say that a vacuum cleaner that draws 10 amps at a voltage of 120 volts uses 1,200 Watts of energy, or 1.2 kilowatts. This is important, because generators are rated in terms of Watts or kilowatts (1 kilowatt (kW) equals 1,000 Watts), and the power requirements of the devices that you hook onto your generator must not exceed the continuous power capacity of the generator. More on this later.

A home owner who is serious about getting a generator as a backup to PECO power needs to consider a number of things, but two issues are at the forefront. First is whether to get a portable unit that could have additional uses besides backup power, versus a permanently installed unit, which can protect the house automatically during an outage without any action on the part of the home owner. Second is the power capacity of the generator, regardless of whether it is portable or permanent, since this will determine how many things in your home can run on emergency power. To address these issues properly, one needs to consider how many things are essential to operate during an outage. While this list will vary from person to person, some items will tend to be on everyone's list, such as sump pumps, refrigerators, freezers, heaters, some lights, the water heater, the phone system, etc. This list will determine the power needed, and thus the size of the generator.

## **Portable Generators**

Portable generators are very popular because they are readily available (except during a storm) and relatively affordable. Also, since they are portable, they can be relocated readily for other purposes, especially for outdoor activities, or temporarily loaned to others. These are mounted in a frame that can either be lifted and carried (for small units), or rolled to the desired position (most relatively large units are mounted on a frame with two wheels at one end). Most of them run on gasoline, but there are some that run on propane. Power output varies from 800 Watts for a small hand-carried unit, up to 17.5 kW for a large unit. Most mid-to-large size units use an electric start (with a battery, like a car). Smaller units may be pull-started, like a lawn mower.

### **Pluses for Portables**

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- 1) Lowest cost – many adequate portable generators are in the \$500 to \$1000 range.
- 2) Versatility – can be used for other purposes besides backup power.
- 3) Wide variety of manufacturers, models, sizes, and features.

## Minuses for Portables

- 1) Must be set up and operated outside – even in a storm. Some portables may have problems running in the rain, while others are designed to permit operation in the rain. ***It is not possible to operate a generator within an open garage or other enclosed space, due to the risk of carbon monoxide poisoning, which can be fatal.*** In fact, the garage door(s) should be closed if it is operating in the driveway.
- 2) Requires that long heavy duty (12-gauge) extension cords be used to bring power to where it is needed. Since the generator is outside, the cord must go through a partially open door or window, then run through the rooms of the house to the device that is connected to it. If a manual transfer switch is installed, this would greatly simplify the connection to a portable generator.
- 3) Units to be powered must be unplugged from wall outlet, and connected to the extension cord, unless a transfer switch is installed.
- 4) Does not protect house (sump pump, heater, refrigerator, etc.) if owner is not home to set it up and operate it.
- 5) Most require gasoline, which must be stored safely, and these units must be maintained to prevent problems from “stale” gasoline during periods of non-use. Units that burn propane are easier to maintain because propane burns cleaner.
- 6) Runs for a finite length of time, determined by size of gas tank, and rate at which fuel is used. One needs to ensure that the fuel supply on hand is adequate for a prolonged outage, or be available to refill or replace the tank, if needed. ***Refilling a gasoline tank should never be attempted while the unit is running.***

## Permanent Generators

Permanently installed backup generators are also available, although their price is significantly higher. These units operate automatically, and are hard-wired into the house, where a special switch, called an Automatic Transfer Switch, is used to power selected circuits within the house when the regular power goes out, and the backup generator comes on. They run on either Natural Gas, supplied from the gas supply within the house, or on tanks of Propane (one or the other, not both). It is interesting to note that the same unit will deliver more power when set up for propane, as opposed to natural gas, since propane delivers more energy per volume than natural gas.



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When the regular power goes out, after a short delay, the backup generator starts up (from a battery, like a car). After it has reached operating speed, the Automatic Transfer Switch disengages the selected circuits from the regular supply, and connects them to the generator. Thus, devices on those circuits can continue to operate after only a brief delay (less than a minute). The generator will run continuously until the regular power comes back on, at which time the transfer switch disengages from the generator, and sets those circuits back on regular power. The generator will then shut down automatically after a brief cool-down period. Permanent generator capacities vary from 7 kW on up to 20 kW and beyond. A 20 kW unit should be adequate for running nearly everything in most homes.

## Pluses for Permanently Installed Units

- 1) Completely automatic operation – Home owner does not need to do anything at time of outage.
- 2) Devices remain connected to wall outlets.
- 3) Larger generators can readily operate as many devices as the home owner chooses.
- 4) Generators operating on Natural Gas can run for as long as the outage lasts.

## Minuses for Permanently Installed Units

- 1) Significantly higher cost. Prices range from ~ \$3,200 on up, depending on the size of the generator and the difficulty of installation. The township requires an electrical inspection, and there are likely to be one-time licensing and permit fees.
- 2) Must be installed outside – may be a problem for some homes without sufficient space on the sides or the back. Location must be approved by both neighbors and the RAP Architectural Committee.
- 3) Additional hardware (transfer switch) needs to be mounted near the electrical panel, and additional heavy cables and gas line need to be installed. May be a problem for some finished basements. Having a drop ceiling makes installation easier.

## Output Power

As stated above, the power requirement for the generator will be determined by the

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electrical load, which means: How many things do you expect to run, and how much current do they draw? Obviously, a small generator will only be able to run a few things, while the larger units can run many items, possibly even the whole house if they are large enough (~ 17-20 kW). All generators are protected from overload by circuit breakers, so if you end up putting too much of a load on it, the breaker will trip to protect the generator.

In order to determine the capacity of the generator that you would need, you must add up the power requirements for all the devices that you expect to operate simultaneously. If the appliance lists its wattage, that is what you should use. If it lists amperage, then calculate the wattage by multiplying the amps by its voltage (either 120 or 240 – small generators may only supply 120 volts). For example, a sump pump that draws 5 amps would be rated at 600 Watts. A light fixture using 3 60-Watt bulbs would be 180 Watts. Refrigerators vary according to type and size, but most should be in the range of 800 to 1200 Watts. The gas heater blower and controls would probably use about 700 to 900 Watts. Televisions are likely to be in the 140 to 200 Watt range. Whole-house air conditioning units are real power hogs, using between 3,000 to 7,000 Watts, depending on size and efficiency rating.

Once the total wattage has been computed for the desired devices, this figure should be multiplied by 1.25 to get the continuous rating needed for the generator. This is done to limit the load to about 80% of the generator's rated capacity, leaving a reasonable margin for error and to avoid operating right at the limit. This value will determine the minimum capacity for the generator. There is a table below which can give a general idea about the proper size for a generator. This table was obtained from a brochure on the Generac line of generators, and assumes that a transfer switch is used.

# Generators

## Sizing a generator is based on **your needs.**

By sizing your generator according to your needs instead of your home's square footage, you won't overspend or be surprised by inadequate coverage.

Decide what items are important to you in a power outage. These items are powered through circuits in your breaker box. The number of chosen circuits decides your generator size. Use this chart as a guide to determine the power you need.

	7 kW	8 kW	10 kW	14 kW	17 kW	20 kW +
Circuits	8	10	12	14	16	200 Amp
Air Conditioning	2-ton	2-ton	3-ton	up to 4-ton*	up to 5-ton*	up to 5-ton*
Kitchen	■	■	■	■	■	<b>UP TO WHOLE HOUSE COVERAGE</b>
Furnace	■	■	■	■	■	
Sump Pump	■	■	■	■	■	
Number of Bathrooms Backed Up	1	1	2	2	3	
Number of Bedrooms Backed Up	1	2	3	4	5	
Living Areas	■	■	■	■	■	
Well Pump or Water Heater		■	■	■	■	
Home Office			■	■	■	
Garage			■	■	■	

\* For multiple A/C units check with your installer for installation options. Rooms and appliances indicated here are for example only. Professional sizing is recommended.

Another consideration for generators using either a manual or automatic transfer switch is the number of individual circuits that can be supported by the switch. This is usually in the 8 to 12 range for capacities from 7 to 10 kW, and is 14 or more circuits for higher capacities. This simply means that you may not be able to apply emergency power to all the circuits in your main panel, and those that are not connected thru the transfer switch will not work off the generator. Thus, careful selection of the circuits is needed in these cases, in order to ensure that all the required devices receive power from the generator. Also, the home owner must be aware that there may be other devices on some of the

# Generators

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selected circuits that were not intended for emergency power, and therefore should not be turned on when the generator is running, since their power requirements were not factored into the load on the generator. (In other words, don't run the vacuum cleaner unless you planned for its load.) The best approach is to have the capacity to run everything that is on any circuit that goes through the transfer switch.

## **Maintenance**

All generators, both portable and permanent, require maintenance, just like any mechanical device. Periodic maintenance will include changing the oil, the oil and air filters, and the spark plug(s). Portable units should be powered up periodically to ensure that they will start, and, if equipped with electric start, to charge their batteries. Those running on gasoline also need special attention if they are expected to sit idle for an extended period of time (several months or more), to avoid carburetor problems. Permanent generators typically run automatically once a week for about 20 to 30 minutes, at a preset time, to ensure proper operation and charge the battery. In fact, batteries themselves should be checked for proper operation, and may need to be replaced after 3 years or so. Service contracts are available for permanent generators to ensure that the required maintenance is performed, usually on an annual basis. This would be a good option for those who would not be inclined to perform any maintenance themselves. Most generators should have a warranty for 1 or 2 years, and extended warranties may be available for permanent units.

In order to facilitate maintenance, permanent generators must be mounted where there is adequate room (about 3 feet) to service the unit on all sides. For safety, they must be at least 5 feet away from the gas meter and any windows, and cannot be placed under low decks. However, they can be located under high decks that permit a person to stand upright. Such decks are typical with houses having walk-out basements. For simplicity, efficiency, and cost, they should be placed as close to the main electrical panel as is reasonably possible. If the distance from the generator to the main electrical panel exceeds the nominal value (about 30 feet), then there will be additional installation costs.