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## **I. Introduction**

**“An ounce of prevention is worth a pound of cure.”**

**Building Maintenance You Can Understand** is a very simple title. The quote above nicely summarizes the purpose of this manual. This guide has been written to start the reader thinking about their home or building and to begin to identify potential problems that, with a little guidance, can prevent expensive problems.

This guide is not intended to be an exhaustive “how to” or a “step by step” instruction manual. It will give basic information to steer and guide the reader to a quick resolution of the problem they are facing. The authors hope the guide will be informative and will help the reader to understand potential problems in their home or office.

### **DISCLAIMER?**

*\*Note: This content is for informational purposes only. The authors make no warranties and bear no liability for use of this information. The information is not intended, and should not be construed, as legal, tax or investment advice, or a legal opinion. Always contact your legal, tax and/or financial advisors to help answer questions about your business's specific situation or needs prior to taking any action based upon this information.*

## II. Exterior

### Roofing

A good maintenance plan for roofs is to perform a visual inspection at least twice a year (at the start of each season would be even better) and after any major storms or serious weather. Water problems are often the #2 priority with a building only behind Building Safety. Left unchecked moisture can travel, cause significant damage, and drive up repair costs.

- For a pitched /shingle roof, if all areas of the roof are plainly visible, walk around and be on the look-out for damaged, loose, or missing shingles.
- On a flat roof, be on the look-out for cracked, blistered (raised), or low areas where water can pool.
- On either type of roof, if available and safe to use, climb a ladder and inspect the areas around any antennas, chimneys, vent pipes, or skylights for damaged or missing flashing.
- Remove any debris accumulation; wet leaves and other material can hold water and rot in location. This rotting material can cause roofing material to lose integrity which can lead to a leak. Moss can also be a problem and should be addressed as early as possible by power washing or brushing.
- Make sure tree branches and limbs do not come in to contact with roofing or siding as they can quickly damage either. Trim small branches if possible. Call a professional if larger limbs need to be removed safely.

Sometimes roofs develop leaks years before the entire roof needs to be replaced. Usually, on a pitched roof, these leaks are caused by localized damage like missing or cracked shingles. On a flat roof, leaks are often caused by a blistered or cracked area. If your roof is leaking, locating a leak will greatly simplify repairs. It is best to look for a leak when it is raining. In an unfinished attic or crawl space, safely climb into the space and look around with a flashlight. Water coming in through the roof at one point may travel quite a distance from the actual point of entry to the apparent leak point. Watch for a gleam of water in the flashlight beam and try to trace the water back to its highest point on the roof; this should identify the source of the leak. Once found, try to mark the leak by outlining the wet area with chalk.

If there is a finished ceiling directly under the leak, it can be harder to locate the source of the problem. One method to trouble-shoot would be to draw a rough plan of the roof in the leak area including the location of any chimney, vent pipes, ridges, or intersections, and if it can be safely attempted, inspect each of these spots close to the leak; any place where two surfaces meet is a potential trouble spot.

**IMPORTANT NOTE:** Adequate safety measures must be taken for any roof inspection or repair, never try to attempt a repair that is above your skill level or you feel unsafe performing. Never work on a roof while it is still wet. It must dry out completely before a leak can be repaired.

Once a leak has been located, several repair guides can be found at hardware stores or contact a professional roofer provide potential solutions to address the leak.

## **Gutters**

A good maintenance plan for gutters coincides with the schedule for roof maintenance. Gutters and drains need to be kept clear to prevent water from overflowing or backing up and causing damage to roofing or walls. Gutters should be inspected at minimum twice a year in spring or fall to look for debris build-up or blockages. Cleaning gutters should be done using a ladder that is tall enough and stable enough to reach the gutters safely and comfortably. After removing all loose debris, flush the gutters with a hose. Check to make sure downspouts are draining properly; if blocked, they can be opened using a plumber's snake.

## **Exterior Walls**

Common materials for exterior walls are aluminum or vinyl siding, brick, or concrete. Maintenance for each material varies, but as with roofing & gutters, it begins with a regular inspection.

- Aluminum Siding – look for dents or scratches. It may be possible to push small dents out. Larger dents may require replacing an entire panel. Scratches should be touched up with paint to minimize oxidation points. Siding should be cleaned annually to rinse off the previous year's accumulated dirt and dust. If build-up is light, simply rinsing with a hose may be sufficient. For heavier build-up, simple cleaners can be used with a long-handled brush and then rinsed off.
- Vinyl Siding – while nearly maintenance-free, vinyl siding should be rinsed off annually to remove dirt. Ongoing care should be exercised to make sure that objects are not leaned against it as they can scratch or break the plastic. Being plastic, keep heat sources (grills, fire pits, etc.) at a safe distance as the siding can melt. Replacing panels will be the only way to repair damage of this sort.
- Brick – with proper attention, brick should not be difficult to maintain. Annual cleaning by rinsing with a hose should be sufficient in most cases. Brick walls can be susceptible to freeze/thaw cycles both at the brick face and at the mortar joints between bricks. Look for cracked or spalled (flaking or fragmenting) bricks. Also inspect for crumbling or disappearing mortar between

the bricks. These can be indicative of larger problems that may require professional help to address.

- Concrete – has relatively low maintenance requirements. Concrete can stain; washing on a regular schedule will help minimize this. Power washing is often the best method to keep concrete walls clean. Inspect at least annually for cracks or water damage. Both can lead to costly repairs if not addressed early. Small cracks should be filled with special epoxies to reduce the chance of the crack becoming larger. A professional concrete contractor is often the best source for addressing water issues.

## **Sidewalks and Walkways**

Property owners are often responsible for the maintenance, repair, or replacement of sidewalks and walkways. It can be helpful to check with the local department of public services to determine the requirements of your specific location. If any of the items listed below are severe, check with the local department of public services on repair or replacement options.

Sidewalk maintenance varies throughout the seasons. During spring, summer, and fall, review all areas of the sidewalk or pathways and look for any of the following items.

- Step Separation – any height difference between areas of a walkway that could cause someone to trip or keep a wheelchair or stroller from passing smoothly. If the difference in height is greater than 1”, many sources recommend using white spray paint to mark the protruding edge.
- Badly Cracked Concrete – holes or rough spots that could create any of the obstacle hazards listed above.
- Low Areas that Trap Water – depressed or indented areas can collect water and debris which can reduce the slip-resistant nature of the concrete surface and create a slip hazard. Clean debris away if possible.
- Tree Root Damage – roots from large trees and even small trees located close to a walkway can grow to the point of causing surface damage or height differences that could create a trip hazard. See “Step Separation” above if the difference is greater than 1”.
- Vegetation Overgrowth – any ground cover, tree limbs, or other growth that can block a path or create obstacles. This should be trimmed back to allow for unimpeded travel on the walkway.

Maintenance during the winter usually consists of keeping the walkway clear of snow and ice. Many communities require snow to be cleared within 24 to 48 hours of the last snowfall. Snow should be shoveled or plowed first. If ice is present, de-icing chemicals can be used to help break-up the ice for easier removal. De-icing chemicals

are not intended to melt large quantities of snow or ice. If temperatures will remain below ~20° F for a sustained period of time and ice is present, winter sand can be used to provide additional traction and minimize slip hazards.

### **III. Basements and Crawl Spaces**

Basement maintenance has both an interior and exterior component. The exterior component consists of an inspection around the outside of a building to look for easily visible issues. This inspection should be completed in the spring and fall.

- Debris should be removed from around the foundation as well as from any window wells.
- Downspouts from gutters should be checked to make sure that they are not draining against exterior basement walls but are out and away from the foundation.
- Any exterior damage to the visible portion of basement walls should be noted and reviewed to see if it gets worse over time. These areas should also be noted for the time when internal basement walls are inspected. If water, moisture, or cracks propagate through to the internal wall, it may be time to contact a professional contractor to see what options are available to correct the issue.

The interior component consists of inspecting the walls, floor, and ceiling of a basement. Basements should be inspected after any heavy rains or spring thaw. One of the key concerns is any damage or deterioration that could allow moisture in to the basement.

- Cracks in the foundation (walls or floor) should be identified as early as possible to keep ahead of potential problems. One method is to mark a crack with tape or a marker and list the width or diameter of the crack. If the crack increases in size, contact a professional contractor to see if this is cause for concern and what can be done to address the issue.
- Weeping walls or wet spots in the foundation should be identified as early as possible. Damp basements can be common during heavy rains and spring thaw, but signs of moisture at other times can be indicative of other issues or problems. It may take a professional to identify the root cause of the problem.

In addition to inspecting for moisture, an interior inspection should include a check of exposed plumbing or electrical systems as well as visible insulation to identify any deterioration of these systems. Also look for any abnormal leaning or sloping of the floors, walls, or ceiling. If identified, these issues should be promptly investigated.

Crawl spaces should be inspected regularly and frequently. Taking the time to inspect a crawl space can help avoid a major problem. The intended purpose of a crawl space is to allow access to plumbing and electrical systems. When properly designed and ventilated, they can also help cool a structure by allowing air to circulate freely. However, they can often trap moisture and this can lead to mold and mildew growth. Once either of these appears, they can spread to other areas of a structure and create an unhealthy environment. Crawl Space Maintenance at its simplest is keeping moisture out of the crawl space.

When inspecting a crawl space, keep an eye out for the following.

- Standing water on the ground of the crawl space or any plastic barrier material covering the ground under the crawl space. This can indicate moisture build-up or water draining in to the crawl space.
- Wet or damaged insulation which can be a starting place for mold or mildew growth.
- Debris in and around the crawl space. This should be removed as soon as possible as it can attract pests and also hold moisture in an otherwise dry area.
- Rotting wood in a crawl space can attract insects or be a signal of the weakening of the support system of a structure.

If any of the above items are found, it can be helpful to contract an HVAC (Heating, Ventilation, and Air Conditioning) contractor to determine if major repairs are required or if the solution can be as simple as properly venting the crawl space. Most crawl spaces require foundation vents. An HVAC contractor can also notify if there are issues with any existing vents or if additional vents should be added as well as when to open and close the vents to minimize moisture build-up. In worst case scenarios, a contractor could also advise if encapsulation (complete sealing) of the crawl space would be required. Encapsulation can be an alternative to standard ventilation; however it can be expensive and can only be done by a professional.

## **IV. Heating and Cooling Systems**

There are three basic types of heating systems; natural gas or propane gas forced air furnaces, hot water boiler and heat pumps.

Forced air heating and cooling systems - Forced air furnaces are the most common of all heating and cooling systems. This type of heating system works by burning natural gas or propane gas to heat air as it is forced through a heating chamber and then into a duct system. A furnace is a complex system but to keeping the furnace running effectively and to extending its life is relatively simple.

### **Care and Maintenance**

- Changing the filter - this should be done on a regular basis - How often the filter needs to be replaced is dependant on several factors but it is best to begin by checking your furnace filter monthly. If it looks like it needs to be replaced, do it. It is better to be overly cautious than to damage the furnace. The influential factors that can cause more frequent filter changes are:
  - a. Type of filter - pleated filters do not require changing as often because they have more surface area and it takes longer for dust to collect. The deeper the pleat and the thicker the filter the less the filter will need to be changed.
  - b. Location - buildings and homes located near farms, heavy industrial plants or near a major highways will require more frequent changes. Thus due to dust and dirt created during planting and movement of traffic.
- Cleaning the furnace - at least once a year you should check the furnace for dust or cob webs and vacuum if necessary. Also keep the area around the furnace clear of objects. Surrounding the furnace with objects can starve the furnace for air and can create a fire hazard. Give it plenty of air to breath.
- The vent - occasionally you should check the vent to make sure it still has a vertical incline and does not have a dip before running through the wall or ceiling. Vent pipes should always rise toward the ceiling. The pipe connections should be checked to make sure they are tight and have not become loose.
- Furnace and cold weather start-up - before cold weather sets in, and the furnace is needed everyday, you should turn the thermostat up 2-3 degrees above the room temperature and allow the furnace to run 10 -15 minutes. While the furnace is running listen for high pitched noises and sounds that do not sound typical. If you think you have a problem contact a reputable contractor to check your furnace. Doing this early will help prevent delays in getting the furnace repaired



- Air conditioning and warm weather Start-up - if the furnace is equipped with an air conditioning unit there are several steps you should take before you started the air conditioner.
  - a. Furnace Filter - check the filter and change if necessary.
  - b. Inspect the outside condenser for damage and make sure it is clean. If the condenser is dirty clean it using a garden hose. Spray the outside of the unit starting from the top and moving toward the ground. This will flush the debris from the unit. Keeping the coils clean will increase efficiency and reduce the likelihood of damage to the condensing unit. After the outside unit has been checked and cleaned let the condenser unit sit for several minutes before starting.
  - c. Turn down the thermostat 2 - 3 degrees below room temperature and allow the air conditioning to run 10 - 15 minutes. While the furnace and outside condenser are running listen for high pitched noises and sounds that do not sound typical. If you think you have a problem contact a reputable contractor to check the furnace and condenser. Doing this early will help prevent delays in have the system repaired.

### **Common Problems with Forced Air Furnaces**

- a. Condensate Drains - Most furnaces produce condensation through the heating and cooling process. A drain is needed to move the water away from the unit. The industry standard is to use white  $\frac{3}{4}$  inc PVC plastic for the drain. Over time the drain can become clogged with algae. To help prevent water damage the drain should be cleaned every spring and fall.
- b. Batteries need replaced in thermostat. Many electronic thermostats require batteries and they need replace periodically.
- c. Thermostat not set on the correct setting. Make sure it is switched to heat or cool and set to the desired temperature.

### **Boiler Systems**

A boiler uses natural or propane gas to heat water in a small tank. The heated water is circulated through pipes using an electric circulation pump. The heating pipes can be run to each room or under flooring. Very little maintenance is required for boiler systems but they are not without troubles.

### **Care and Maintenance**

There are three basic things to consider when working with a boiler system

- Slope - all radiators are dependant of proper slope of the pipes. All pipes should slope back toward the boiler. Excessive hammering noises and

popping sounds may be attributed to improper slope in the pipes. If you hear hammering or popping in the pipes make sure your pipes tilt slightly toward the boiler.

- Water Level - The water in a boiler system should be about half full. You want to leave an air gap between the water and the top of the tank. When the water level gets too low it can cause inadequate heating. You will still hear the pump running and the boiler burners will be lit but you will not feel the pipes getting hot. Most modern boilers are equipped with an automatic fill system that will keep the water at the appropriate level. Consult a professional to learn how to fill your system with water. If you continually have to fill the water tank there may be a leak in the system. Check your pipes for leaks.
- Pressure Tank - the pressure tank is typically located at the top of the system but in older homes the tank may be located in the attic. The expansion tank keeps the system under pressure so the heated water does not turn to steam. You can make sure the tank is working properly by touching the tank. The bottom half should feel warm and the top half cool. If the entire tank is warm it will need to be drained. Contact a professional to learn how to drain the expansion tank.

Heat Pumps – Heat pumps are the least common source of heat for most homes. Due to Federal tax credits and a rise in their popularity, there are more and more being installed. These are very complex systems and are difficult to trouble shoot or in some cases may not appear to be faulty. Because of the complexity of these systems it is recommended that you consult a qualified contractor to make repairs.

- There are two basic types of heat pumps. The first uses an underground water source from a well or closed loop system. The second uses the outside air, and then forces that heat through a duct system. Many of these heating systems will have a heating coil to help produce heat during extreme cold making them expensive to operate. They are best used in moderate climates but can be found in Northern Indiana and Kosciusko county.
  1. Water source heat pumps - Regardless of the water source both systems operate using the same principle. As water is circulated through the heat pump, the compressor extracts the heat from the water and produces heat that is then forced into a duct work system.
    - a. Closed loop system – this system uses the same water by circulating it through a series of looped pipes buried in the ground. As the water is pumped through the pipes the water is warmed by the ground temperature. The cycle continually repeats itself. This same system is used to cool the house.

- b. Well system - The water for the heat pump is supplied by a well. The water is pumped directly into the heat pump and is discharged and not reused.
- 2. Some of the main parts of a heat pump include an outdoor coil, refrigerant, a compressor and an indoor coil. No matter how hot or cold it is outside, there is almost always heat or cold associated with that temperature.
  - a. Heat - The second type of heat pumps works by drawing heat from the surrounding environment and pumping it into another environment. Air passes over the outdoor coil, which sucks the heat out of it and puts it into the refrigerant. The captured heat makes the refrigerant warm and turns it into a vapor. These vapors travel to the indoor coil that is on the inside of the home. When the indoor air meets the heat in the indoor coil, it gets warm and travels through the home vents, spreading warmth throughout the home.
  - b. Cooling - The outdoor coil captures the heat from the air just as it does when it intends to warm the house. However, when the warm air meets the indoor coil's extremely cool refrigerant, the heat doesn't last very long. It gets absorbed so quickly that the air loses all humidity, which condenses outside of the coil. A fan pushes that super cool air into the ducts. The refrigerant turns from liquid to vapor in this process because of the absorbed heat. That vapor goes through a special vapor line to the outdoor coil which dissipates the heat, making the vapor a liquid again. That liquid goes through a liquid line back to the indoor coil and once again acts as a refrigerant.

### **Care and Maintenance**

Follow the care and maintenance outlined under Forced Air heating and cooling systems. Although the heat source is different both systems use air filters and should be operated before the change of the seasons.

## **V. Plumbing**

There are many problems that can come from the plumbing in a building or house. There are too many to try to address every issue that might be encountered. The following lists are simple solutions to help prevent common problems that can occur in any building or home.

Plumbing Fixtures – There are hundreds of different styles and makes of faucets, toilets, showers and sinks. There is not enough time to compile a list of all the problems you may encounter because the list is virtually endless. Each fixture comes with its own care and maintenance needs. This manual is not an attempt to identify and solve each problem, it is designed to put you on the correct path and get the problem fixed as soon as possible.

### **Common Problems**

A dripping faucet or a running toilet are the most common plumbing problems. The costs of a dripping faucet or a running toilet can add up quickly. A faucet dripping two times a minute can add up to 70 gallons of water in a year. A faucet dripping 60 times a minute can use 5 gallons of water in a day. A toilet can use 1-2 gallons of water an hour. Making repairs quickly is a must.

- Dripping Faucet - To help prevent high water bills by simply shutting off the water supply. Locate the valve under the sink and turn it clockwise. Repairing a faucet is relatively simple but you should consult a plumber or plumbing expert. Be sure you know the manufacturer and make of the faucet.
- Running Toilet - There can be several causes for a toilet to continually run. Most often the problem is caused by worn parts in the tank. The water tank has two parts. A flush valve and a fill valve. A problem with either part can cause the toilet to run continually. If the toilet cannot be repaired quickly the water supply can be shut off. The water valve will be located under the tank on the left side of the toilet.
- Commercial Urinal or Toilet - A urinal or toilet can use 1 – 2 gallons of water a minute if they are allowed to run continuously. Using a wrench or hammer tapping lightly on the top of the stainless steel valve will often stop the fixture from running. You should have the commercial fixture repaired.
- Clogged Drains - Clogged or slow drains usually happen over a period of time. It can be prevented by filling and draining the sink or tub with water

on a regular basis. This helps to loosen any debris that may be building up in the plumbing. You should consult a professional if your drain is already clogged. Be careful of drain opening products as these products can be hazardous and can damage metal pipes. There are several quick and easy ways to clean a drain that do not require the use of hazardous chemicals. If the tub/shower and sink drains are draining slowly or not at all you may have a clogged drain in the ground. Seek the advice of a professional if this happens. Specialized tools are needed to clear blockages.

## **Septic Systems**

Septic systems are very common. Most people tend to be very leary and are constantly concerned about the system backing up into the house. A septic system is designed to let natural bacteria breakdown and liquify waste. The use of anti-bacterial soaps, bleach, laundry detergents and other chemicals can kill the natural bacteria in the septic system. If the bacterial is not continually replaced the waste material will continue to buildup in the system until the septic backs up in the building or home.

## **Common Problems**

- Loss of bacteria in the septic tank. There are several manufactures on septic system bacteria and they can be found in most retail stores. Many of the manufactures recommend that you use the product every month. Doing this will help the septic system stay healthy.
- Reduce the amount of chemicals that are being drained into the septic system. Chlorine Bleach is particularly bad for a septic system and should be used sparingly or not at all. Bleach is great at killing the bacteria that is necessary to breakdown the wastes in your system.
- Have the system cleaned regularly. Many septic cleaning companies recommend cleaning every two years. It is best to plan on having the system cleaned regularly to help with the cost and to prevent the system from becoming full. The frequency of cleaning the system largely depends on how many people use the system and what types of chemicals are used. Planning ahead is the most important factor.
- What to do if your septic system becomes full – If all the drains in the building or home become clogged it is likely that the system is full. The only thing that can be done is to have the system cleaned out. Contact a professional to have this done.

## **Hot Water Heater**

Hot water heater – A hot water heater heats and stores hot water to a set temperature for use in a home or building. The hot water heater heats water by burning natural gas, propane gas or by using electricity.

## **Common Water Heater Problems**

No hot water – Not having hot water is the most common problem to be found with water heaters. The first thing to do is identify what type of water heater you have. Water heaters come in different sizes and shapes but operate using gas or electricity.

### **Electric Water Heater**

1. Check the electrical panel to make sure the breaker is not tripped or the fuse is not blown. If that is not the cause see step 2.
2. Thermostat - The water heater should also be equipped with a thermostat to control the water temperature. The thermostat will have its own circuit breaker. Follow these steps to check if the thermostat is working
  - a. Turn off power to the water heater this will be a double pole breaker or a pair of fuses. Locate 2 metal covers on side of water heater.
  - b. Remove both covers and the pad of fiberglass insulation behind them. Touch tank at both upper and lower locations and note if it's warm or cold.
  - c. Remove plastic covers over terminals. Note how they fasten so you can replace them later. Push the red button located at the center of the thermostat. There should be a clicking sound as the limit switch is reset.
  - d. Replace the plastic cover, insulation and metal covers.
  - e. Turn on power to water heater. You should hear a popping or similar noise to indicate that the water is beginning to heat. **IMPORTANT!** Unless you are qualified to work on energized equipment do not go any further!! Consult a professional plumber or contractor.

## **Natural Gas or Propane Gas Water Heater**

1. The most common cause for not having hot water is the pilot light has gone out. Follow the steps to relight the pilot light.
  - a. Set the gas-control knob to the “Off” position and turns the thermostat to its lowest setting (typically clockwise in both cases). Wait 5 minutes for any gas to clear. If after 5 minutes you smell gas, do not proceed. Call the utility company for immediate service.
  - b. Open or remove the outer and inner access covers for the burning chamber using a wrench or pliers. Use a flashlight to locate the end of the pilot-light tube that extends from the gas-control valve into the burning chamber. Adjust your position so you can comfortably reach this point with a wooden match and see what you are doing.
  - c. Turn the control knob to the pilot position and immediately hold a match near the end of the pilot-light tube. Depress and hold the reset button on the gas-control valve (see illustration). Remove the match as soon as the pilot lights, but keep the button depressed for about a minute.
  - d. If the pilot does not remain lighted, repeat all these steps. Otherwise, turn the gas cock on the control valve to the “On” position, set the thermostat to the desired temperature and replace the access panels. For scald protection the water temperature should be set at no more than 120 degrees.

### **A Leaking water heater**

Turn off the water valve located on the cold water line and then contact a professional plumber. To prevent further water damage you can drain the water heater by attaching a garden hose to the bottom drain and running the hose outside. Make sure where you are draining the water is lower the water heater. If the water heater is in the basement, drain the water into a bucket, floor drain or sump pump pit.

## **VI. Electrical**

In most modern homes and buildings, the electric is managed and delivered by an electrical service box/panel. This electrical panel is where the feed coming from the electric company is then split up and distributed throughout the home. While most people do not venture near their electric panel too often, it is one of the most important pieces of equipment in the home. Take a moment find and open the door on your electrical panel. You may be surprised at how the electric courses through your home. Your entire home and your family are protected by those little black rectangles or fuses.

The possible locations for the panel are:

- The garage
- The basement
- Laundry/Utility room
- In an apartment the panel may be located in a closet

It is important to know the difference between a fuse panel and a circuit breaker panel. Circuit breakers and fuses perform the same basic function, to automatically relieve an overloaded circuit. Circuit breakers can be re-set hundreds of times and cost more to replace. Fuses need to be replaced each time the circuit is overloaded but are inexpensive. They each have their strong suits, but they are fairly equivalent in some respects.

### **Breaker Panels**

How reset a tripped breaker – Be sure to have a flashlight handy. Electrical panels are not always located in well lit areas.

- Turn off the light switches and unplug appliances in the room that has lost power. This will help prevent damage to the appliances when power is restored.
- Find your circuit breaker box and open the cover.
- Locate the tripped breaker. Circuit breakers are small, usually horizontal switches labeled by the areas of the house they serve (for example, "kitchen," "bathroom" and so on). The tripped circuit breaker will be in the "off" position or in a middle position between "on" and "off."
- Reset the breaker by moving it to the full "off" position and then back to "on." That may clear an overload and return power to the room. If the breaker re-trips, you may have too many lamps and appliances plugged into the circuit; a damaged cord or plug. If you cannot



identify the cause you may need to consult a professional to correct the problem.

## **Fuse Panels**

How to replace a blown fuse – Be sure to have a flashlight handy. Electrical panels are not always located in well lit areas. Shinning the light on the fuses will make identifying the blown fuse quicker and easier

- Turn off the light switches and unplug appliances in the room that has lost power. This will help prevent damage to the appliances when power is restored.
- Find your fuse panel and open the cover.
- Locate the blown fuse. Fuses should be small, round and made of glass. The panel should be labeled by the areas of the house they serve (for example, "kitchen," "bathroom" and so on). Look for a break or blackened area visible through the glass of a screw-in plug fuse. If all the fuses look good, identify the fuse according to the circuit label (map) printed on the door or next to each fuse. If the panel is not labeled then removal of the fuses one by one may be necessary to identify the faulty fuse.
- Remove the fuse by unscrewing it counter clockwise from the panel. The fuse may be a bit difficult to remove. Replace the fuse with a new one by turning it clockwise. If the breaker re-trips, you may have too many lamps and appliances plugged into the circuit; a damaged cord or plug. If you cannot identify the cause you may need to consult a professional to correct the problem.

**Note:** Fuses come with different amperage ratings. Be sure to replace a fuse with the same size and same amp rating. The local hardware store or home improvement center should carry fuses. It is always a good idea to have spare fuses on hand.

Common Amp sizes

15-A - For lights and outlets

20-A - For more commercial settings or larger wiring sizes

30-A – For large appliances like stoves or hot water heaters

## **VII. Flooring**

### **Selecting the Right Flooring**

There are more options than ever when selecting the flooring for your property. No one type of flooring is right for everyone because we all want something different and the difference often starts with the amount of traffic that you can expect. Tile, laminate, and carpet would all be appropriate selections.

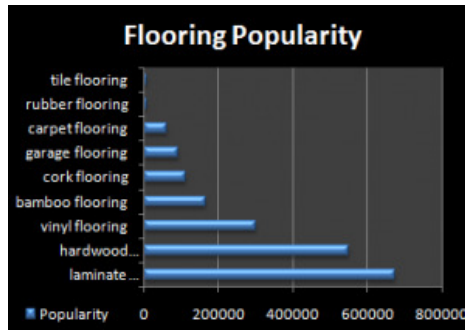
When selecting a floor there are several questions that need to be asked prior:

1. How much traffic will it get?
2. Who will use the room?
3. Where will furniture be placed?
4. What maintenance will be needed?

When it comes to selecting the right flooring, a lot depends on budget, type of setting and general requirements. Choose a floor that is consistent with the quality and image that you would like to project.

### **Different Types of Flooring**

- *Hardwood Flooring* – A great selection. Upscale and elegant, hardwood flooring creates a warm and inviting look. There are a wide range of finishes and species to choose from. Engineered floors are easy to install and do not warp or expand like solid hardwood floors. Wood laminate is another type of floor that gives you the look and feel of wood but is considerably less expensive. Laminate flooring is extremely durable and easy to clean.
- *Vinyl Flooring* – A very versatile option. It can be cut and trimmed to create any design of your choice. Vinyl is resistant to moisture and comes in a wide range of finishes and patterns.
- *Tile Flooring* – Tile is ideal for spaces that need to be clean and sterile. You can select from ceramic or stone tile. Tile can create a stylish, very natural look.
- *Carpet* – There are many choices of carpet to select from. There is wool or synthetic carpet. A good carpet will muffle sounds and will be easy on your body. Carpet tiles represent a great alternative to conventional carpet. Carpet tiles are now available in an extensive range of colors, styles, and patterns, carpet tiles can be used in unique ways.



## Different Types of Carpet

### **Cut Pile**



In cut pile carpet the usual loops are cut, resulting in a flat, plain finish. The density of the pile, what fiber is used in construction and amount of twist in the pile will determine the quality and durability of the carpet.

### **Level Loop**



This carpet features loops of pile that are of the same height, hence the name. Again, density of the fiber and type of fiber used will determine the quality and durability.

### **Multilevel Loop**



This carpet has loops of pile at different heights, thereby allowing interesting patterns to be created in the carpet.

### **Textured (or "Frieze")**



Textured carpet is cut and twisted to form a patterned carpet design. The twist in the pile gives the carpet a hardwearing surface that resists marks from vacuums and footprints well.



Carpet Fibers (provided by [carpetbuyershandbook.com](http://carpetbuyershandbook.com))

The esthetics and performance of carpet is similar to the fabric in your clothing. The type of fiber used, the construction of the cloth, and the color all play a role in the styling, cost, and performance of that garment. Each fiber has its own set of characteristics that set it apart from the others.

Selecting the right **Carpet Fiber** is one of the most important aspects in selecting the right carpet. Various fibers and how they are used in carpet dictates how easy the carpet will be to clean and how long it will last and retain its bulk, texture and color. There are five main fiber types.

Comments	Wool	Nylon	Polypropylene Olefin	Acrylic Modacrylic'	Polyester
Resiliency – Determined by fiber structure and modifications.	Good to excellent	Excellent	Excellent	Fair to excellent	Good to excellent
Abrasion Resistance – Determined by fiber and density of face fiber – the more tightly packed the yarns, the more resistant to wear.	Good to excellent	Excellent	Excellent	Fair to excellent	Good to excellent
Soil & Stain Resistance/Cleanability – Determined by color, texture, dyes, fiber structure and modifications.	Good to excellent	Good to excellent	Good if oily soils and stains are treated promptly.	Good	Good to excellent – oily stains should be promptly treated.
Resistance to Sunlight – Determined by fiber structure and modifications.	Poor – If protected from ultraviolet rays, degradation does not occur as rapidly.	Good – special dyes may be used to inhibit sun damage.	Loses strength and deteriorates unless chemically modified to resist sunlight damage.	Excellent resistance. Prolonged exposure may cause deterioration in some pieces.	Good – may weaken with prolonged exposure.

Static – Determined by fiber structure and modification.	Builds up in low humidity unless modified.	Builds up in low humidity unless modified.	Builds up in low humidity but at a lower level than nylon or polyester	Builds up in low humidity unless modified.	Builds up in low humidity unless modified.
Hand	Warm, soft	Varies from warm and soft to cold and coarse.	Waxy, soft	Warm, soft	Varies – finer deniers are soft and silky.
Resistance to Mildew – Determined by fiber structure and modifications	Poor if damp or soiled.	Fiber may be modified	Excellent	Excellent	Excellent
Flammability – Determined by fiber structure, modification, construction methods, dyes, padding and carpet installation methods	Burns slowly indirect flame; considered self-extinguishing. Burning hair odor.	Burns slowly, melts in direct flame; self-extinguishing. Structure may alter what occurs. Celery-like odor.	Melts at low temperatures (170°C); burns and emits heavy, sooty, waxy smoke. Paraffin wax odor. Pulling a heavy object across the carpet surface can cause enough friction to melt the carpet fibers.	Acrylic burns readily unless modified. Modacrylics are difficult to ignite, will not support combustion, are self-extinguishing and dripleless. Acrid odor for both.	Burns slowly, melts; some are self-extinguishing. Chemical odor.

Flooring is a very important aspect when looking at your design options. It is crucial to choose the most appropriate and durable option for the space in which it will be installed as well as the most attractive and cost effective type.

**Hardwood Floors Care & Maintenance**

Wood is a natural product that lives in a comfort zone of 35% - 55% relative humidity, and between 60 and 80 degrees Fahrenheit. To ensure a long life of your wood floor, the HVAC system should remain active at all times.

- Sweep or vacuum regularly.
  - Vacuum head must be a brush or felt type
  - Make sure the wheels of the vacuum are clean
- Remove spills promptly using a soft cloth
- Never mop or flood your floor with water

- Do not use oil soaps, liquid or paste wax products that contain lemon oil, tung oil or ammonia
- Keep pets nails trimmed and paws clean and free of dirt, gravel, grease, oil and other stains
- Use a dolly and protective sheets of plywood when moving heavy objects
- Make sure furniture casters and floor protectors are clean and operate properly
- Remove shoes with spiked or damaged heels before walking on the floor

### **Laminate Flooring Care and Maintenance**

- Routine cleaning requires only dust-or-damp-mopping or vacuuming
- Hard surface cleaners or plain tap water are best for damp-mopping
- No waxes, polishes, varnish coatings, detergents, abrasive cleaners, or mop-and-shine products should be used
- Put felt or plastic caps on the feet and legs of your furniture and chairs
- Rolling chairs and wheelchairs should have soft rollers suitable for laminate flooring
- Use doormats when possible
- Use thick pads or rags when moving large appliances over laminate

### **Vinyl Floor Care and Maintenance**

- Protect and do not disturb the sealed seams on your sheet flooring for at least 16 hours after the seam sealer application to ensure a proper seam bond
- Keep traffic to a minimum during the first 24 hours to allow the adhesive to harden
- Furniture should not be placed on the floor for 24 hours so the adhesive has had adequate time to dry
- Always move heavy furniture and appliances with care to avoid gouging or tearing the floor
- Wash your floor with suitable resilient floor cleaner 48 hours after installation
- Make sure furniture legs have large surface, nonstaining floor protectors
- Use mats at outside entrances when possible, to prevent dirt, grit and soil from being traced onto your floor
- Draw drapes and blinds during peak periods of strong sunlight. Resilient floors, like other home furnishing products, may discolor or fade when overexposed to the sun
- Avoid wearing stiletto or spiked heels on your floor
- Sweep or vacuum regularly to remove dirt and grit
- Do not use a vacuum with a beater brush
- Wipe up spills promptly with a damp cloth or mop

### **Tile Care and Maintenance**

- Wipe glazed wall tiles periodically using a cloth or sponge dampened with a neutral, not oil-based household cleaner

- Vacuum glazed floor tiles regularly to remove dirt and other gritty particles, then damp mop or sponge with a neutral, all-purpose, non oil-based cleaner
- Do not use ammonia
- Do have a damaged or broken tile removed and replaced only by a qualified tile contractor

### **Carpet Care and Maintenance**

- Vacuum your carpet regularly. The type of carpet you have will determine the type of vacuum you should use. See your installation company for further information and instructions
- Consider professional cleaning every 12 – 18 months
- Use scissors to clip sprouts or snags, do not pull them as you may damage the carpet
- Stroke carpet with the edges of a coin to remove a dent caused by furniture
- If flooding occurs, the carpet will need to be dried, front and back, by a professional cleaner
- A wet/dry vacuum cleaner is the best way to effectively remove stains

## **VIII. Energy Efficiency**

Most commercial facilities require a high volume of electrical power to run their operation. Whether your facility is a manufacturing plant, shopping center, doctor's office or a not-for-profit organization, you will need to evaluate the benefits of energy efficiency within company. Though each company is different in what they need, there are basic things that each and every business can do to use energy efficiency to improve their bottom line.

Today, buildings use more energy than any other sector of the United States economy, consuming more than 70% of electricity and over 50% of natural gas. By investing in an energy efficient program at your company, you can expect to have an energy efficient building that will use less energy, cost less to operate and improve comfort, thus providing savings to the bottom line.

Let's take a look at different energy-saving tips for your home or business.

### **Lighting**

- Turn off lights when not needed.
- Reduce or replace inefficient, outdated or excessive lighting within your office.
- When replacing old lighting equipment, evaluate new technologies that may need fewer fixtures and/or fewer lamps within existing fixtures.
- Ensure that light levels will remain at adequate levels before changing out technologies and / or reducing number of lamps.
- Where practical, replace incandescent lamps with compact fluorescent lamps (CFLs). Ensure you install compatible dimming technology if CFLs are used along with a dimming system.
- When fluorescent T-12 lamps burn out, consider retrofitting fixtures with T-8 lamps and changing from magnetic ballast to electronic.
- Replace incandescent "EXIT" signs with LED signs. LEDs use about 1/10 the wattage and last 50 times longer than incandescent-lamp signs.
- Install lighting occupancy sensors that automatically turn lights on or off, depending on occupancy. These sensors work well in areas such as conference rooms, break rooms or individual offices that are not occupied continuously.
- Take advantage of natural daylight: turn off or dim electric lighting when adequate sunlight is available to illuminate interior space. Adjust blinds and window coverings on windows that receive direct sun.
- Ensure outdoor lighting is off during daytime
- Conduct an audit to determine if any areas of your office are over-lit and energy is being wasted. Pay special attention to copy rooms, break rooms, individual offices and hallways.
- Determine if any areas of your parking lot are over-lit. Replace low-pressure sodium parking lot lights with low wattage induction lamps using fixtures that direct light down.



## **Heating & Cooling**

- Establish a preventative maintenance program for your heating, venting and air conditioning (HVAC) equipment and systems. Ensure that you regularly:
  - Change or clean all air filters, preferably every month
  - Clean all heat exchanger surfaces, water and refrigerant coils, condensers and evaporators.
  - Repair leaks in piping, air ducts, coils, fittings and at the unit.
  - Replace defective equipment insulation, ducting and piping.
- When replacing air conditioning units of five tons or greater, purchase units with a high energy efficiency ratio (EER) of 10.5 or more to reduce operating costs for the life of the unit. Ensure that your contractor performs a “Manual N” calculation to select properly sized system based on your building load characteristics and specific occupancy needs.
- When old motors fail, replace them with premium efficiency motors that operate at a lower annual cost. Ensure you specify the proper sized motor for the application.
- Install variable speed drives (VSDs) on large motor loads, where appropriate, to further reduce energy usage.
- Use outside air and water side-economizers for “free cooling” when outside air temperatures and conditions permit –during the spring and fall.
- In facilities with older chillers, consider replacing them with new energy-efficient units that operate at or below .60 kilowatts per ton.
- Keep windows and doors closed to prevent the loss of cooled air.

## **Water Heating**

- Install aerated faucets and low-flow showerheads to reduce the amount of hot water used for washing hands, cleaning instruments or for employee or guest showers.
- Consider shutting off or turn down hot water heaters at night, on weekends, or over periods of not-use.
- Replace old water heaters with high-efficiency models.

## **Temperature Control**

- In winter, set office thermostats between 65 and 68 degrees during the day/business hours, and 60 to 65 degrees during unoccupied times.
- In summer, set thermostats between 78 and 80 degrees during the day/business hours and above 80 degrees during unoccupied hours.
- Adjust thermostats higher when cooling and lower when heating an occupied building or unoccupied areas within a building, e.g., during weekend and non-working hours.
- During summer months, adjusting your thermostat setting up one degree typically can save 2 – 3% on cooling costs.
- Consider installing locking devices on thermostats to maintain desired temperature settings.
- Install programmable thermostats that automatically adjust temperature settings based on the time of day and day of the week. If you have

multiple HVAC units, set thermostats to return to the occupied temperature a half an hour apart.

- In larger facilities with energy management systems (EMS), verify that temperature set points and operating schedules are correct for the controlled equipment. For EMS systems that no longer operate as initially designed, consider a retrocommissioning project to restore the system's functionality.

### **Office Equipment**

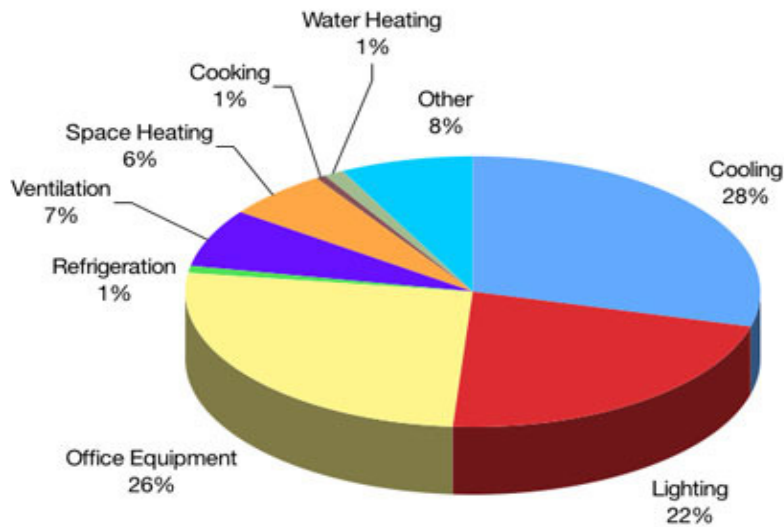
- Energy efficiency features on office equipment do more than just save money on electricity. They also help systems function more reliably, saving you time, and protect equipment from burnout and other problems.
- To conserve energy and reduce internal heat gain, turn off computers, monitors, printers and copiers during non-business hours.
- To save energy during periods of inactivity, ensure that the built-in power management system for your office equipment is active.
- Ensure your screen saver is compatible with the computer's power management features, and that the setup allows the system to go into power saver mode.
- According to E-Source, using a laptop computer instead of a desk-top system can save 80-90% in electrical cost.
- When purchasing new office equipment, look for ENERGY STAR. The ENERGY STAR office equipment program promotes energy-efficient computers, monitors, printers, fax machines, scanners, copiers and multi-function devices that automatically power down during extended inactivity. Energy saving of 50% or more is possible.
- Install plug load controllers in cubicles to control multiple loads like monitors, task lights and fans. These devices use a motion sensor that is incorporated with a plug load surge suppressor. Inactive equipment can be shut down when the cubicle is unoccupied.
- Specify ENERGY STAR equipment when purchasing or negotiating a contract for new vending machines. The ENERGY STAR machines incorporate energy efficient compressors with refrigeration and lighting controls. Efficient vending equipment can save 30-50% over older equipment.
- Do photocopying in batches and with the duplex setting when possible to allow your copier to spend less time in the active mode.

### **Employee Involvement**

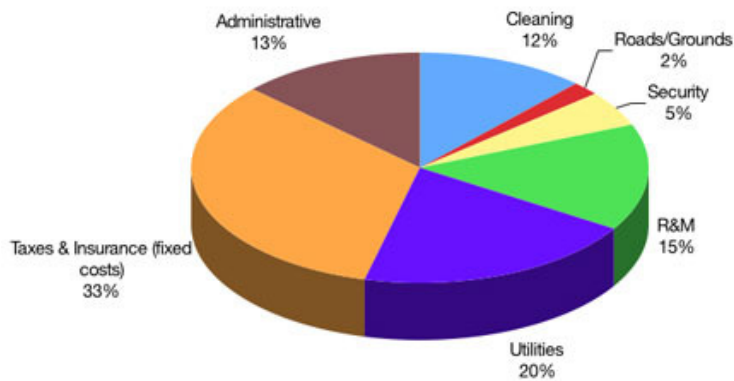
- Educate and encourage employees to be energy-conscious and to offer ideas about how energy can be saved. Employee buy-in and involvement can make or break your company's efforts to conserve energy.
- Designate a "responsible party" to be responsible for and to promote good energy practices for the organization and / or facility. This individual should work with management to facilitate energy savings ideas and strategies – optimizing energy use and costs minimized overhead and operation costs.

*Information provided by SRP and CPS Energy*

There are many opportunities for you to save time and money within your home or organization. We would strongly encourage you to sit down as a team or family and make a business case for improved energy efficiency in your workplace. Remember there are more than just the financial gains to improving your efficiency. You will also need to consider the non-financial and indirect financial benefits of such an investment.



**Yearly Energy Costs For An Office Or Building**  
Costs can also be applied to a home or Apartment



**Estimated Yearly Operational Costs For A Business**

## **X. Attachments & Schedules**

### **Quick Information**

Necessary Equipment Information
Equipment Name: _____
Manufacture: _____
Serial Number: _____
Model Number: _____
Location of Equipment: _____
Filter Size: _____
Capacity (gallons): _____
Comments: _____
_____
_____
_____
_____
_____

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## **Recommended Internet Web-site Resources**

General home repair knowledge

[www.ehow.com](http://www.ehow.com)

[www.howstuffworks.com](http://www.howstuffworks.com)

[www.lowes.com](http://www.lowes.com)

[www.homewizard.com](http://www.homewizard.com)