

## Preventative Maintenance

### What is Preventative Maintenance?

Preventive Maintenance (PM) is based on a cause-and-effect relationship between scheduled maintenance and operating reliability. Since mechanical parts wear out, the reliability of any equipment directly relates to operating age and servicing. Therefore, equipment that is serviced or overhauled as needed will help to better protect it against the likelihood of failure.<sup>1</sup> A green home is not only built with green materials and systems, but is also operated and maintained with green practices and procedures. The home's energy and water efficiency, indoor air quality, durability and resource efficiency are determined as much by its operation and maintenance as its design. The cost of operating and maintaining (O&M) a home over its lifetime far exceeds the initial construction costs, so reducing O&M costs can lead to substantial savings for the homeowner and preservation of resources in the environment.<sup>2</sup>

### How to Implement Regular and Preventative Maintenance

Preventative maintenance can extend the life of a home's systems, equipment and materials. Some examples of systems that benefit from preventative maintenance include ventilation systems, water fixtures, and automatic sensors. Keep a list of all equipment and track equipment conditions and maintenance year round.<sup>3</sup> This inventory should include information on component condition and functional performance, as well as information on equipment age, usage, location, model number and warranty. Besides the equipment checklist, a checklist of standard housekeeping categories including grounds check, exteriors, roof, windows/doors, plumbing, attic, and cooling/heating systems should be done each fall season.

Regular equipment maintenance is the consistent upkeep of equipment and appliances in the home. Regular maintenance keeps equipment and appliances running efficiently, which in turn reduces energy demands as well as costs. Equipment benefitting from regular maintenance includes:

- **Appliances.** Basic maintenance on appliances generally results in more efficient operations, energy savings, and cost savings. Some examples of typical appliance maintenance are keeping refrigeration coils clean, keeping the food scrap bin empty in the dishwasher, and keeping lint traps and vents clear on the clothes dryer. Another important appliance to regularly maintain is the exhaust fan found in kitchens and

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<sup>1</sup> Whole Building Design Guide. [http://www.wbdg.org/resources/rcm.php?r=optimize\\_om](http://www.wbdg.org/resources/rcm.php?r=optimize_om) (accessed May 13, 2010).

<sup>2</sup> M. Landman Communications & Consulting. Green Operations & Maintenance Manual for the Plaza Apartments: Best Practices for a Healthy and High-Performance Building. <http://www.practitionerresources.org/cache/documents/639/63985.pdf> (accessed October 20, 2010).

<sup>3</sup> New Jersey Skyline Insurance Association. Home Maintenance Checklist. <http://www.njsi.com/pdf/NJSIHomeMaintenanceChecklist.pdf> (accessed November 2, 2010).

bathrooms.<sup>4</sup> Detailed instructions on regular appliance maintenance can be found with the new product or on the manufacturer's website.

- **Heating and Cooling Systems.** There are a wide variety of heating and cooling system elements that need regular maintenance. First and foremost, all heating systems should be annually inspected and maintained by a certified contractor; the best time to do this is at the beginning of the heating season. Filters on heating and cooling systems should be changed or cleaned at least every 3 months to ensure positive indoor air quality and free air flow.<sup>5</sup> Furnaces, flues, and chimneys should be inspected and maintained each year in order to check for any damage, since this could result in the release of particles or harmful gases. Finally, even regular maintenance on furnaces that are new is important. It is possible for corrosion to occur and combustion gases to leak.<sup>6</sup>

Air ducts have not been considered an important source of indoor air contaminants or particularly instrumental in preventing health problems.<sup>7</sup> Consider having ducts cleaned, however, in cases where there is mold visible on the inside of the ducts or on other components of the heating and cooling systems; where there have been vermin present; or where there are excessive amounts of dirt or debris in the supply registers. The National Air Duct Cleaning Association can be helpful in guiding the decision to hire a service.<sup>8</sup>

Avoid the ten most common homeowner mistakes by<sup>9</sup>

- Changing furnace filters as needed
- Caulking around tubs and showers
- Having weatherized and properly fitting operable windows
- Repairing leaking faucets and valves
- Clearing away vegetation growing on the building exterior
- Keeping grading high around the home's foundation and sloping away from the foundation to keep water from ponding around the structure and migrating below
- Reducing interior moisture by using exhaust fans
- Maintaining caulking on exterior walls

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<sup>4</sup> US EPA. An Introduction to Indoor Air Quality (IAQ). <http://www.epa.gov/iaq/biologic.html> (accessed April 27, 2011).

<sup>5</sup> ENERGY STAR. Save Energy at Home, [http://www.energystar.gov/index.cfm?c=products\\_pr\\_save\\_energy\\_at\\_home](http://www.energystar.gov/index.cfm?c=products_pr_save_energy_at_home) (accessed October 13, 2010).

<sup>6</sup> US EPA. Green Building, Indoor Air Quality, The Inside Story: A Guide to Indoor Air Quality, <http://www.epa.gov/iaq/pubs/insidest.html#iaqhome1> (accessed October 13, 2010).

<sup>7</sup> US EPA. Indoor Air. Should You Have the Air Ducts in Your Home Cleaned? <http://www.epa.gov/iaq/pubs/airduct.html> (accessed April 27, 2011).

<sup>8</sup> National Air Duct Cleaning Association. <http://www.nadca.com/> (accessed April 27, 2011).

<sup>9</sup> US Inspect. Multimedia Homeowner's Guide. <http://www.usinspect.com/WelcomeHome/index.html> (accessed April 22, 2011)

- Ensuring adequate ventilation for exterior air conditioning condensers

Review product material safety data sheets (MSDS), available from manufacturers, for all chemicals used in the home and look for the most resource efficient and non-toxic alternatives when servicing or making repairs.

### **Moisture Reduction**

Moisture can cause many problems in the home, so it is important to ensure that it is minimized as much as possible (see [Moisture Control](#) strategy). Dehumidifiers can be used to reduce moisture in the home and it is very important to clean dehumidifiers regularly according to the manufacturer's instructions.<sup>10</sup> Ventilation fans are also a good way to keep moist areas, such as basements, dry. Any areas that get wet in the home need to be dried out thoroughly within 48 hours in order to prevent growth of any mold.<sup>11</sup> Pipes need to be regularly inspected for any leaks or drips, and if any are discovered, they must be promptly repaired.

### **General Housecleaning**

Simple housecleaning can go a long way in terms of regular preventative maintenance. When using a vacuum around the house, choose one with a high efficiency particulate air (HEPA) filter to reduce allergens.<sup>12</sup> Vacuuming and cleaning around vents, baseboard heaters and radiators, and cold air returns will reduce dust buildup, which is an indoor air pollutant.<sup>13</sup> Other important housecleaning maintenance items include professional carpet cleaning (look for services that provide chemical-free cleaning and use low-water processes) and sealing garbage and food waste and removing it often.<sup>14</sup>

Preventative maintenance can help avoid more costly repairs. For example, keeping the roof free of debris and mold growth will extend the life of the roof. Another example of preventative maintenance is trimming the trees and shrubs away from the foundation of the home and ensuring there is no wood-soil contact around the perimeter of the house. These conditions attract termites and carpenter ants, which can cause potential structural damage. Taking preventative measures can save the expense and environmental impact of using chemicals to contend with wood-destroying insects. See Table 1 at the end of this strategy for an example of a basic standard preventative maintenance checklist that homeowners can use on their homes.

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<sup>10</sup> US EPA. Green Building, Indoor Air Quality, The Inside Story: A Guide to Indoor Air Quality, <http://www.epa.gov/iaq/pubs/insidest.html#iaqhome1> (accessed October 13, 2010).

<sup>11</sup> US EPA. A Brief Guide to Mold, Moisture, and Your Home. <http://www.epa.gov/mold/moldguide.html> (accessed April 27, 2011).

<sup>12</sup> US EPA. Guide to Air Cleaners in the Home. <http://www.epa.gov/iaq/pdfs/aircleaners.pdf> (accessed April 27, 2011).

<sup>13</sup> National Association of Home Builders, Don't Ignore Outdoor Home Maintenance Chores This Fall, <http://www.nahb.org/generic.aspx?genericcontentID=125909&fromGSA=1> (accessed October 13, 2010).

<sup>14</sup> US EPA. Green Building. Bedroom <http://www.epa.gov/greenhomes/bedroom.htm> (accessed October 13, 2010).

## Benefits

Not only does preventative maintenance have great implications for the health, safety, and comfort of the occupants of the home, it will affect the home's environmental impacts and its financial performance. Effective maintenance goes a long way in preventing the need for costly repairs and optimizes equipment operations. In addition, a well maintained home can increase resale value.

- **Energy savings.** Conducting regular maintenance like cleaning air filters and getting annual servicing for HVAC systems can improve the efficiency of those systems, and therefore save energy and money.<sup>15</sup> Keeping these systems maintained and in working order also saves money since replacements will generally be needed less frequently.
- **Air quality improvement.** Indoor air quality is improved by regular maintenance of equipment. Changing and cleaning air filters often will allow them to work better and capture more dust, allergens, and other particulates in the air. Many different kinds of equipment and appliances run on combustion. Some examples are furnaces, water heaters, ovens, and stoves. If not maintained properly, these pieces of equipment can release excessive amounts of combustion pollutants, like carbon dioxide, carbon monoxide, nitrogen dioxide, and other particulates.<sup>16</sup> Regular maintenance on pipes and other damp areas can reduce excessive moisture, preventing mold growth and airborne mold spores. Reducing gases, particulates, and other airborne pollutants protects the health of the occupants of the home. Air pollutants can cause a range of health issues, including but not limited to irritated eyes, nose, and throat, headache, dizziness, fatigue, asthma attacks, respiratory disease, and even cancer.<sup>17</sup>

## Costs

Homeowners should expect to spend between 1 to 3% of the value of the home on annual home maintenance and repairs.<sup>18</sup> Preventative maintenance reduces energy use, improves indoor environmental quality, extends the life of equipment, and saves money over time. Regularly maintaining equipment and appliances saves money over time by reducing the frequency of repairs and replacement and saving energy costs. By keeping equipment and appliances running efficiently, they use less energy, and therefore result in reduced energy bills. Finally, it is important to check to manufacturer warranty on equipment and appliances; often, annual

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<sup>15</sup> ENERGY STAR. Save Energy at Home, [http://www.energystar.gov/index.cfm?c=products.pr\\_save\\_energy\\_at\\_home](http://www.energystar.gov/index.cfm?c=products.pr_save_energy_at_home) (accessed October 13, 2010).

<sup>16</sup> US EPA. An Introduction to Indoor Air Quality (IAQ). <http://www.epa.gov/iaq/combust.html> (accessed April 27, 2011).

<sup>17</sup> US EPA. Green Building, Indoor Air Quality, The Inside Story: A Guide to Indoor Air Quality, <http://www.epa.gov/iaq/pubs/insidest.html#iaqhome1> (accessed October 13, 2010).

<sup>18</sup> HouseMaster. Inspection Services. <http://www.housemaster.com/index.asp?p=inspection&s=whatweinspect&t=checklist> (accessed November 2, 2010).

maintenance will be included for a few years. This allows equipment to be serviced at no extra cost to the homeowner. Simple maintenance tasks like cleaning air filters, vacuuming refrigerator coils, and cleaning out exhaust fans require only time from the homeowner, not money. For more complex maintenance such as annual furnace servicing, paying a professional may be a better option. Annual contracts are often available and service costs will vary with the system. The money spent on the professional will be worth the savings in energy and replacement and repair costs.

## **Resources**

ENERGY STAR. Save Energy at Home,

[http://www.energystar.gov/index.cfm?c=products.pr\\_save\\_energy\\_at\\_home](http://www.energystar.gov/index.cfm?c=products.pr_save_energy_at_home)

Preventative Maintenance Program Home Checklist

[http://www.ehow.com/list\\_6971273\\_preventive-maintenance-program-home-checklist.html](http://www.ehow.com/list_6971273_preventive-maintenance-program-home-checklist.html)

US EPA. Green Building, Indoor Air Quality, The Inside Story: A Guide to Indoor Air Quality,

<http://www.epa.gov/iaq/pubs/insidest.html#iaqhome1>

US Inspect. Multimedia Homeowner's Guide.

<http://www.usinspect.com/WelcomeHome/index.html>

Whole Building Design Guide – Reliability-Centered Maintenance

[http://www.wbdg.org/resources/rcm.php?r=optimize\\_om](http://www.wbdg.org/resources/rcm.php?r=optimize_om)

Table 1: Standard Preventative Maintenance Checklist<sup>19</sup>

Around the House:	Date Checked	Repairs/Service Performed
Grounds		
<b>Check window wells and storm drains</b>		
<b>Seal driveway and walkway cracks</b>		
<b>Check fencing and gates</b>		
<b>Check and trim trees</b>		
Exterior		
<b>Check for proper drainage away from house</b>		
<b>Check for deteriorated or damaged siding</b>		
<b>Seal any cracks or gaps</b>		
<b>Check for finish or paint deterioration</b>		
<b>Shut off exterior faucets and drain water</b>		
Roof		
<b>Check for loose, damaged or missing roofing</b>		
<b>Check condition of chimney and vents</b>		
<b>Check flashing for damage or poor seal</b>		
<b>Clean all gutters and leaders</b>		
Windows and Doors		
<b>Check and reset screens with storms</b>		
<b>Check putty, glazing at windows and glass doors</b>		
<b>Check for leaks (caulk and weather strip)</b>		

<sup>19</sup> EHow.com. [http://www.ehow.com/list\\_6971273\\_preventive-maintenance-program-home-checklist.html](http://www.ehow.com/list_6971273_preventive-maintenance-program-home-checklist.html) (accessed October 13, 2011).

Plumbing

**Insulate water lines that are subject to freezing**

**Check conditions of water heater**

**Clean and secure dehumidifier**

Attic

**Insulate over attic stairs and hatches**

**Fill in gaps in insulation cover**

**Check ventilation openings for nests, blockage**

Heating/ Cooling Systems

**Remove (or winterize room air conditioners)**

**Have heating system checked by serviceman**

**Check all radiators and valves**

**Lubricate all pumps, fans and motors**

**Test and start humidifier**