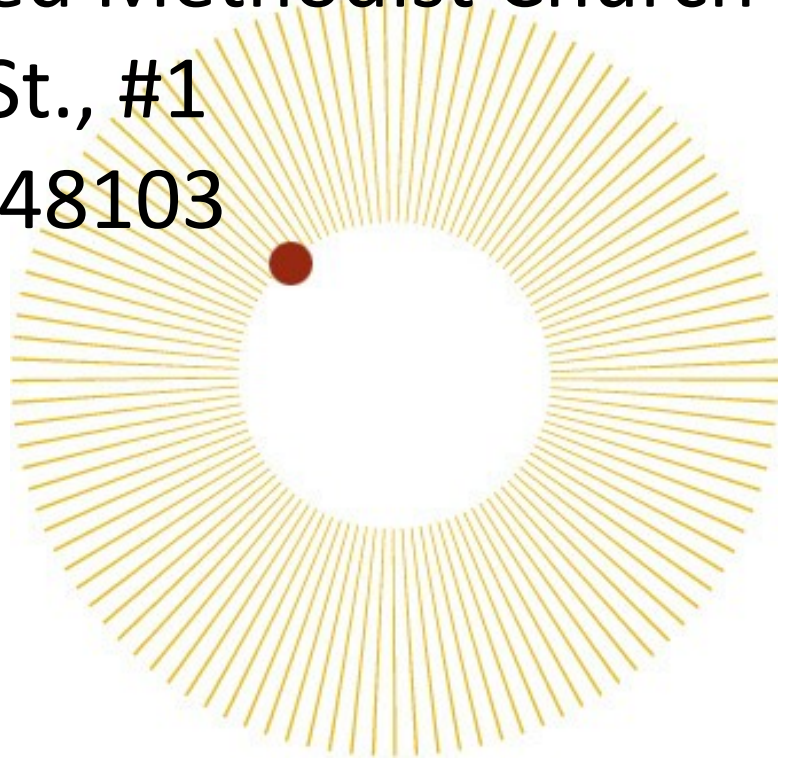


# Introductory Energy Evaluation

West Side United Methodist Church  
900 South 7th St., #1  
Ann Arbor, MI 48103

Inspected On: 12.10.2009



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EXECUTIVE SUMMARY

BACKGROUND

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## ENERGY CONSERVATION OPPORTUNITIES

A walk through investigation of the West Side United Methodist Church was conducted on December 10th, 2009. During the on-site investigation, the following areas of improvement were found. They have since been prioritized based on two considerations; (i) An approximate projection of energy savings, and (ii) Current needs of the facility. More information about these ECOs can be found beginning on Page 7 of this report.

### **ECO #1: Efficient Lighting System**

Replace outdated T12 lamps with T8's, incandescent with CFL's, consider the use of LEDs, and replace high output lamps in parish with more efficient alternatives. Install task lighting as and consider revision of lighting design.

### **ECO #4: Occupancy Sensors**

Install occupancy sensors in low traffic areas or where lights are likely to be left on by occupants, some examples include bathrooms, stairways, and meeting rooms.

### **ECO #3: Seal Thermal Envelope**

In cases where a rehabilitation is not necessary, add or replace weather stripping, caulk, or spray foam to seal the thermal envelope while retaining historic integrity.

### **ECO #5: Water Conservation**

Install efficient toilets, urinals, and faucets. Also consider installing retrofit kits to increase performance without the cost of a total rehab.

### **ECO #6: Appliances and Office Equipment**

Reduce the amount of unnecessary appliances running and turn them off when not in use. Also specify certified efficient products when purchasing.

### **Additional Information**

- Materials
- Indoor Environmental Quality (IEQ)
- Site and Landscape
- Purchasing
- Preventative Maintenance Worksheets

## ABOUT THIS ANALYSIS

This report is titled an Introductory Energy Evaluation because it (i) Identifies opportunities for the building to perform in a more energy efficient manner, saving on operating costs, (ii) Identifies other opportunities for the building to be maintained in ways that are healthy for the occupants and the environment, and (iii) It provides resources should further investigation into the suggested ECO's be desired.

This report is intended to help in immediate decisions about capital improvements. Many of the recommendations included within this report, as well as additional information, can be found in EnergyStar's Guide for Congregations. This report is a great resource for future reference and can be found online at:

[http://www.energystar.gov/index.cfm?c=congregations\\_guidebook.congregations\\_guidebook](http://www.energystar.gov/index.cfm?c=congregations_guidebook.congregations_guidebook)

The recommendations contained within this report are made in an attempt to help the organization achieve better energy efficiency. Most of the recommendations made are prioritized based on approximate payback periods in order to help the organization financially. However, there are also sections oriented toward making the reader aware of general practices and considerations that will improve both building occupants quality of life and our ecological footprint..

This report has been created by WARM Training Center in coordination with Michigan Interfaith Power and Light (MiIPL). WARM's role in this report it to provide the corporations with adequate information and viable opportunities that match the expectations set forth by MiIPL.



## ABOUT MICHIGAN INTERFAITH POWER AND LIGHT

Michigan Interfaith Power & Light (MiIPL) is a coalition of congregations across the State of Michigan whose mission is to involve communities of faith as stewards of God's creation by promoting and implementing energy conservation, energy efficiency, renewable energy and related sustainable practices.



**MICHIGAN INTERFAITH POWER & LIGHT**  
*Involving communities of faith as stewards of God's creation*

## ABOUT WARM TRAINING CENTER

WARM Training Center has been promoting sustainable affordable communities for over 25 years.

WARM began in 1981 as a nonprofit organization training people in weatherization and construction related trades. (The acronym stood for Weatherization And Retrofit Maintenance. Today we just use WARM.) Increasingly WARM provided technical assistance to groups building affordable housing while it continued to train homeowners in repair and maintenance skills needed to maintain their property.



WARM's roots in energy conservation have grown to emphasize all aspects of sustainable development as it relates to housing, including environmental concerns and the importance of good indoor air quality. WARM hosts a Green Building demonstration center and offers seminars and consulting on energy and green building topics. The programs may have changed over time but the goal remains the same: truly affordable, healthy housing and communities.

## ABOUT ENERGY STAR

EnergyStar was introduced by the U.S. Environmental Protection Agency (EPA) in 1992 as a voluntary labeling program designed to identify and promote energy-efficient products..

There are now more than 40 categories of EnergyStar products and services including equipment, buildings, businesses and schools. In addition to labeling quality products, EnergyStar also provides technical guides and assistance in many areas including residential and commercial buildings.

Visit the website at [www.energystar.gov](http://www.energystar.gov) for information specific to your particular needs.



## ABOUT SUSTAINABLE DESIGN AND OPERATIONS

Sustainable design and operations are based on the principles of resource efficiency, health, and productivity. Realization of these principles requires an integrated, multi-disciplinary approach in which a building project and its components are viewed on a full life-cycle basis.

This “cradle-to-cradle” approach, known as “green” or “sustainable” building, considers a building’s total economic and environmental impact and performance, from material extraction and construction, operation and maintenance, and building reuse and disposal.

Successful sustainable design does not depend solely on one aspect of a building project. Rather it is the proper implementation of various systems and their impact on the building as a whole that determines the success.

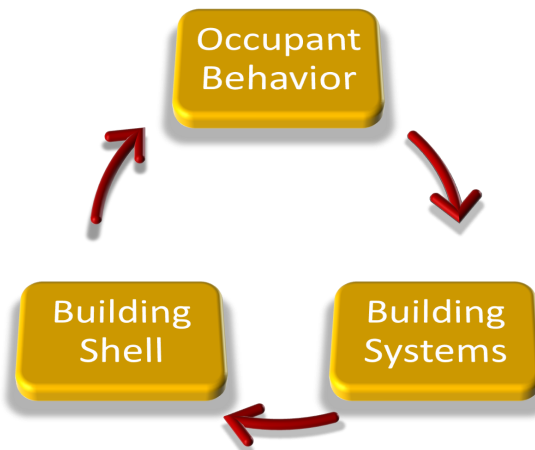
Ultimately, adoption of sustainable building practices will lead to a shift in the building industry, with sustainability thoroughly embedded in its practice, products, standards, codes, and regulations in areas such as:

- Sustainable Site
- Water Efficiency
- Energy Efficiency
- Materials & Resources
- Indoor Environmental Quality

Sustainable design balances human needs (rather than human wants) with the carrying capacity of the natural and cultural environments.

It minimizes environmental impact, and it minimizes importation of goods and energy as well as the generation of waste.

Green, sustainable and energy-efficient design can be incorporated into existing buildings during the course of capital improvements. The improvements can then be energy and resource efficient, provide a healthier environment for occupants, and improve their surrounding environment.



There are three main categories that various energy improvements fall under: Occupant Behavior, Building Systems, and Building Shell.

Occupant behavior improvements are generally the cheapest to implement with little or no up front cost. For instance, by encouraging employees to turn off lights in unoccupied or day lit rooms, additional systems like occupant and lighting sensors become obsolete. However, occupant behavior is often difficult to implement and not as reliable as installed systems. Even with installed systems, occupant behavior and education is important for successfully meeting design goals. For example, when occupant or photo sensors are installed in a building, occupants need to be made aware of its purpose and function, otherwise they may bypass the sensors rendering the system ineffective.

A building's systems are the next bracket of investment, these may be things like lighting type, programmable thermostats, waterless urinals, or time of day scheduling of lights. They often cost more to implement than changing occupant behavior, but are more reliable and show larger future paybacks.

Typically, the building shell's improvements are often the largest financial commitment, but also show large paybacks over the life of the systems. Replacing an entire building's windows or HVAC system will most likely require a tremendous investment up front and may not see a payback for several years. However, after that timeframe the owner will continue to save from his initial investment for the remaining life of the system, perhaps several decades.

While a company is considering energy efficient improvements it is important to account for the possible levels of commitment and view the investment from a long term, whole life cycle, approach. A practical investment, however large or daunting it may be, will often save money in the long run and add monetary value to a building.

## AERIAL PHOTOGRAPH OF THE FACILITY



### West Side United Methodist Church

900 South 7th St., Ann Arbor, MI 48103

## SUMMARY OF ENERGY CONSERVATION OPPORTUNITIES

The following pages show the Energy Conservation Opportunities (ECO's) that we recommend be employed. The ECO's have been prioritized by which would typically yield the largest pay-backs in short and long term savings.

There are two primary methods for which energy is lost from a structure; conduction and convection. Conduction is temperature being exchanged through materials, while convection is temperature being lost through air leakage.

Some ECOs pertain to the building's systems. The building's systems include all of the larger components that together allow the building to function, some examples are lighting, heating and cooling, and plumbing.

Additional general considerations that are simply healthier alternatives for employees and patrons, and simply more environmentally friendly changes to make, are explained in the end near appendices.

## ECO #1: Efficient Lighting Systems

### Compact Fluorescent Lamps

Throughout the campus of West Side United Methodist Church, there are a tremendous amount of incandescent bulbs. These outdated bulbs are extremely inefficient and should be replaced with newer, more efficient Compact Fluorescents. Compact Fluorescent Lamps (CFL's) only use about 25% of the electricity as a conventional incandescent lamp. They also last about ten times longer, cutting down tremendously on continued maintenance costs. Each bulb pays for itself in about six months and may save around \$30 over its lifetime. The life and payback period of CFL's does not justify leaving in incandescent bulbs until they need to be replaced. In most cases there is no benefit in continuing to use incandescent lamps.

Some past purchasers of CFL bulbs have found it difficult to match the lighting levels put out by their old incandescent bulbs, turning them away from the new technology. Fortunately, many CFL bulbs now come with their incandescent equivalent printed on the packaging. This makes it easy to buy a replacement bulb that will suffice in a particular application.

In addition to incandescent lamps, there are also several outdated T12 lamps in the lower dining hall. Any T12 bulbs should be replaced with newer, more efficient T5 and T8 fluorescent lamps with electronic ballasts. These lamps use 20% - 50% less electricity than the old standard T12's. The numbers denote the bulb size in eighths of an inch, so the T8's are a 1 inch diameter lamp rather than the 1-1/2 inch T12. The 4' lamps can still be used after a retrofit, and are actually desired because they are more stable, less expensive, and have a 33% longer service life than the longer 8' lamps. T8 lamps are now the standard building practice in applications with ceiling heights under 20'.

T5 fluorescent lamps are generally used in applications with high ceiling heights over 20'. The lamps are only 5/8 inch thick in diameter and provide a more intense light, especially with high output (HO) lamps. T5's can be a great choice in certain applications but in most cases new fixtures are required so they cannot be easily used in a retrofit, and at heights under 20' excessive glare can become problematic without careful design considerations.

Both T5 and T8 lamps provide a higher quality of illumination; color rendition is better and there is no 'flicker' as is often experienced with standard T12 fluorescent fixtures. T8's especially can be very beneficial in applications like offices and classrooms because there have been studies that confirm increased productivity under such lamps.

Many parishes also find it difficult to replace high wattage bulbs that are common in high ceiling areas like churches. This is one area that West Side United has excelled. With their past purchase of high wattage fluorescent bulbs they have undoubtedly saved a considerable amount of money and have truly set the bar for other parishes in the area.

## Light Emitting Diodes (LEDs)

There are certain applications where Light Emitting Diodes (LED's) are the best option for a retrofit. Task lighting and desk lamps do not need to put out a lot of lumens, so LED's can be a viable option. This new technology produces equal illumination while consuming 95% less energy than outdated incandescent lamps and still 75% less than compact fluorescents.

Exit signs are also a great application for LED's. They use far less energy than typical exit sign bulbs, but the largest benefit is the service life of 20 years which practically eliminates exit sign maintenance costs. Some types of exit signs can be easily replaced with a screw in LEDs so a conversion is quick and easy. If this type of conversion is not possible it may still be cost effective to replace existing signs completely with new LED fixtures.

## ECO #2: Occupancy Sensors

There is a tremendous amount of space within the buildings on the church campus that is seldom utilized by patrons. Installing occupancy sensors on lighting in those areas can have very large payoffs. Such sensors are often useful in utility rooms, stairways, certain offices, bathrooms, community rooms, and anywhere people may occupy them for a short amount of time throughout a day and there is a chance lights can be left on for a significant amount of time afterward. The application of the light as well as the current efficiency of staff turning lights off will have a dramatic impact on how much the sensors will save. The chart to the right shows some typical savings that can be expected after installing occupancy sensors in spaces for various activities, as determined by the EPA. The EPA estimates that the average energy savings for utilizing occupancy sensors is 60%.

Occupancy Sensor Savings	
Open Offices	20% - 25%
Private Offices	25% - 50%
Corridors	30% - 40%
Rest Rooms	30% - 75%
Storage Rooms	45% - 60%
Conference Rooms	45% - 60%

There are several different types of sensors, for use in specific applications. Passive infrared sensors react to changes in heat. When a person moves through the room the sensor will trigger and provide illumination. The sensor must have an unobstructed line of sight in order to register an occupant. The best application of this type of sensors is open areas and corridors where there are little or no obstructions. Microphonic sensors can detect objects around obstructions and are great in areas like restrooms and open areas requiring 360 degrees of coverage. Some sensors use both passive infrared and microphonic technology, but are typically more expensive.

### ECO #3: Sealing the Thermal Envelope

Most of the windows and doors within the church campus are in fairly good condition and will not require a total rehabilitation. Rather than move forward with a total retrofit, these areas of air infiltration can be addressed by simply replacing weather stripping or caulking around windows and doors. Additionally, in order to preserve the historic integrity of the structure, certain components of the building should be left in tact as much as possible. Weather stripping and caulking will allow the church to maintain the historic value of the building's components, like stained glass windows, by not deconstructing the windows and doors or adding components that were not common to that time period, while still reducing energy consumption where easily possible.

In addition to caulking and weather stripping, spray foam can be an excellent product for sealing off from air infiltration. The ability of spray foam to infiltrate tight cracks and crevices is virtually unrivaled in many other products. Especially in masonry walls or attic spaces that are not going to be seen by patrons, spray foam should be applied to ensure that air infiltration is being sealed off effectively. From an environmental standpoint, when purchasing and applying spray foam insulation, it is important to be aware Volatile Organic Compounds (VOCs). VOCs are harmful to building occupants and can remain in the air for a considerable length of time after a product is applied. The organization should be sure to specify low- or no- VOC products when purchasing spray foam insulation, and be sure that occupants are not present when the products are applied. The primary reason that spray foam is recommended where patrons will not see it is simply because, due to the nature of the product and the high expansion rate that allows it to work so well, spray foam is often undesirable to look at, bubbling and clumping to result in a messy and unfinished appearance.

In many instances, even if no visible light or gap can be seen in the window, air infiltration can be felt by placing your hand around the frame. All of the minimal cracks throughout a building can add up to the equivalent of a large window being left open. There should be special care to seal these points. A blower door test can be set up by an energy auditor in individual rooms or wings and suck air in from the outdoors. During the time the fan is running it is much easier to see and feel the outside air infiltration and points of concern.

## ECO #4: Water Conservation

Water is essential for life and is in itself a finite and limited resource, so as population grows there is less water per capita. Water consumption worldwide has tripled since 1980 and is currently estimated at over one thousand cubic miles per year, which is more than the volume of Lake Huron. Energy conservation through reducing water consumption is dual fold; there is of course a reduction in the water used, but in a more extensive scope it will also reduce the energy used to pump, purify, treat, and heat the water.

There are several ways in which organizations can reduce the energy used behind the scenes when water is consumed, some examples are localized water heaters, set back heating temperatures, time of day scheduling on heaters and pumps, localized pumps, and of course minimizing the amount of water consumed.

The United States Environmental Protection Agency (EPA) has sponsored a partnership program called WaterSense. The WaterSense label distinguishes high quality and efficient products. By choosing WaterSense labeled faucets and accessories, organizations can ensure that they are purchasing quality fixtures and accessories that will conserve water.

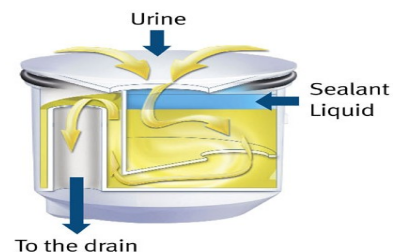


### Sink Aerators

Sink aerators are by far the cheapest and most effective way to reduce water consumption, giving them a tremendously fast payback period. Sink aerators are essentially screens that fit onto faucets and restrict the amount of water flow, without minimizing the size of the stream. Therefore, building occupants cannot tell the difference between conventional faucets and ones with low-flow aerators. As outdated faucets often consume 2.0 - 2.2 gpm (gallons per minute), and low-flow aerators restrict the flow to 0.75 gpm, savings of up to 65% can often be seen. Aerators can be purchased at any local hardware store for just a few dollars in the plumbing section and can be installed in house.

### Waterless Urinals

Waterless urinals are an excellent way to conserve. In new applications, they can be much cheaper to install than conventional flushing urinals because there is no required supply piping and maintenance costs associated with it. However, in our region we have relatively cheap water rates and the replacement cartridges cost around \$40. The usage savings and replacement cartridges are about the same for now. However, the largest saver with waterless urinals is the reduced maintenance costs associated with most flushing mechanisms. Also, as all our utility rates are sure to increase and cartridges should become cheaper as they become more common, installing waterless urinals should be seriously considered.



In addition, there are several varieties of waterless urinals now that reduce the costs associated with cartridge replacements; urinals produced by ecotechwater.com use a different style of cartridge that has a 10 year warranty, and Kohler’s waterless urinals only require occasional of the biodegradable sealant liquid, not the entire cartridge.

## Efficient Toilets

There are several ways to easily reduce water consumption in most toilets without sacrificing convenience or quality. By changing an outdated 3.0 gpf (or worse) toilet to a dual flush toilet you can reduce water consumption by up to 70%; even current standard 1.6 gpf commercial toilets only consume about half the water when compared to outdated models. It is important to note that some of the older “efficient” models from the mid 1980’s were poorly designed and prematurely released. Those early models produced poor results, but the new 1.6 gpf toilets have gained wide acceptance.



Dual flush toilets are an excellent application. They are used mostly in non-commercial applications where there are not urinals. However, they can be used in commercial settings in women’s restrooms. Dual flush toilets handle liquid and solid waste different with two different buttons. The button for solid waste typical utilizes a full 1.6 gallon flush, while the button for dispensing liquid waste only utilizes the necessary 0.8 gallon flush. There is also a commercial retrofit style available.

There are three types of low flush toilets; gravity, pressure-assisted, and vacuum-assisted, and the cost increases in the same order. For most applications, gravity flush toilets perform very well. It should be noted that all three types require proper maintenance. Some of the gravity flush and all of the pressure-assisted and vacuum-assisted units require specialized parts that may be difficult and expensive to find and replace. Using the wrong replacement parts can increase flushing volume significantly.

Retrofitting existing fixtures is an excellent way to reduce water in older facilities without the up front cost of a total renovation. Retrofit kits will reduce the amount of water required to flush a typical toilet or urinal by 0.5 - 1.5 gpf. The kits can be found in most plumbing supply stores, can be installed in house, and generally cost \$25 or less. This would be a great option to investigate to reduce water consumption without the cost of replacing all of the fixtures throughout a building. However, retrofit kits are only recommended as a short-term solution as maintenance costs will continue to rise until new efficient fixtures are installed.

More information regarding ordering efficient toilets and water efficient products can be found in the appendices in the back of this report.

## ECO #5: Efficient Appliances and Office Equipment

In addition to light bulbs, there are other general appliances that can be improved upon within the facilities. We recommended everything from microwaves and toasters to dishwashers be specified as energy efficient. The easiest way to ensure that you are receiving a quality product that is also beneficial to the environment is to visit the Energy Star website and search for certified products. The Energy Star certified products listed on their website have been test verified by Energy Star to reduce energy when compared to most of the industry averages. In general, it is not cost effective to replace newer appliances that do not need to be, but when purchasing new appliances and office equipment the Energy Star label should be specified.

## Materials

To transform a material from its raw state to a usable form is often a miraculous and complex process. During this process, energy and water are consumed, pollution is created; ecosystems, habitats, and human health are impacted. To fully understand the nature of materials in relation to sustainability, instant convenience and disposability must give way to life cycle thinking. Life cycle thinking means to consider the impact of extraction, production, transportation, use and disposal of products and materials. Nature often uses all materials to provide food for other processes.

Recycling typically requires much less pollution, energy, and water than production from virgin raw materials. Because recycling is a cyclical process, implementing sustainable practice involves both purchasing and “disposal.” That is, products that are purchased should either be recycled or with recycled content. When materials or products reach the end of their current use, they should also be recycled. This would also mean purchasing products that are recyclable.

### **Renewable and Certified or Salvaged Wood Products**

Renewable refers to materials that grow back, such as trees. Renewable contrasts with synthetic, in that synthetic materials (such as plastics) are further distorted from nature’s reclamation process, and contain petro-chemicals which do not readily break down and involve more pollution. Managed forests allow trees to regenerate in a balanced manner. A well established certification program, known as the Forest Stewardship Council (FSC), certifies wood products that come from managed forests. Products available made from certified wood include furniture, doors, windows, particleboard, and more. If your facility is ever replacing cabinetry or doors, for example, FSC products can be specified.

### **Local**

Finally, local materials can be an additional consideration in sustainable material choice. Local products support local economies and reduce the need for material shipment which can often involve a worldwide journey. Reducing this transportation reduces the pollution caused by it. Ideally, the product would be both Local and Certified, or both Local and salvaged/recycled for example.

## Indoor Environmental Quality

Indoor environmental quality refers to creating a healthy interior environment, which includes confronting pollutants that exist inside, as well as introducing positive indoor environmental features. Indoor air is often more polluted than outdoor air, in part due to well sealed building envelopes, which are desirable for energy efficiency. Removing or managing pollutants as well as maintaining adequate levels of ventilation and fresh air are the main ways to achieve good indoor air quality.

### **VOC and Formaldehyde**

According to the EPA; Volatile Organic Compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands.

Cleaning Supplies, Paint and Carpet are three examples of common products that should be specified as low or VOC-free products, in order to avoid the negative health effects of the compounds. Cleaning in a way that is healthy also involves the cleaning process and methods. See the green cleaning network for more information ([www.greencleaningnetwork.org](http://www.greencleaningnetwork.org)).

Similarly, Formaldehyde is a chemical that also causes adverse health effects that is used in numerous building products in the interior environment. When specifying furnishings and wood products, specify products that are formaldehyde free.

Two labeling programs that are concerned with Indoor Air Quality as well as other issues are the Environmental Choice Program ([www.ecologo.org](http://www.ecologo.org)) and Greenseal ([www.greenseal.org](http://www.greenseal.org)). Purchasing products that meet their guidelines will ensure that exposures will be safer and more environmentally-friendly than non-certified products.

### **Mold**

The presence of mold can cause health problems to occupants and users. The main prevention is to maintain a watertight building envelope, eliminate plumbing leaks, and properly ventilate, especially in the kitchen and bathroom areas which are susceptible to high moisture levels. If mold occurs, the first step is to fix the cause of the moisture infiltration. Second, the growth should be cleaned and removed. For minor cases, a simple vinegar solution can be used to eliminate the mold, more serious cases require professional testing and remediation.

### **Daylight**

The presence of daylight has been shown to increase health, well being, and productivity of building occupants. Making sure to open curtains to allow light in will help give access, as well as save energy normally required for lighting.

## Site and Landscape

To be truly sustainable, improvements to the landscape and the choice of sustainable methods should be designed in accordance with the existing site conditions and its unique potentials and / or problems that are presented.

Sustainable landscape design can increase energy and water efficiency, manage water on the site, decrease the use of harmful pesticides and fertilizer, increase available habitats for beneficial animals, decrease maintenance costs, and provide positive environments for people.

The parameters can be fully explored with surveys such as soil quality (polluted/not, sandy/clay etc.), grading and draining situation, locating existing utilities and so forth. A sensible awareness of other important conditions such as sun exposure, building orientation, views, use or future use, aesthetic qualities, maintenance issues, and much more can help make the foundation for a thoughtful and suitable sustainable landscape design.

### **Lawn Reduction / Organic Lawn Care**

In general lawns require large amounts of energy (both human and otherwise) to maintain. As well, they do not adequately absorb storm water, so our waterways and sewer systems become overloaded, and the water does not recharge the ground water supply. Along with the water run off comes both the insecticides, herbicides, and fertilizers that are also damaging to local ecosystems. Grassy lawns should be reduced by planting more groundcover and deep rooted local or adapted plants. For any remaining lawn area, using natural techniques, such as an organic herbicide made from corn gluten can prevent toxic exposure to humans.

### **Native Species Plants and Wildlife**

When implementing plant material, use plants that are native or at least adapted to the local climate. This will reduce irrigation costs, will increase the longevity of the landscaping, and will reduce the need for pesticides and insecticides. Adding native perennials and shrubs (under story) will increase valuable wildlife: species for hummingbirds, butterflies, birds and humans can be considered to help sustain and improve the ecosystem.

### **Water Management**

Storm water from the roof can be collected in rain barrels to be used later in the planters and gardens, reducing the need and associated cost of watering the landscape. Another solution for managing storm water and filtering it is by using planting beds.

## Purchasing

The members of MiPL have a great online purchasing resource provided to them that gives them an advantageous position when looking for quality and efficient products. The Interfaith Power and Light coalition has assembled a webpage with ordering information and resources on everything from efficient lighting supplies to solar cooking. Their comprehensive list and additional produce information can be found online at:

<http://www.theregenerationproject.org/shopipl.htm>

Environmentally Preferable Purchasing (known as EPP) involves purchasing products or services that have a lesser or reduced negative effect on human health and the environment when compared with competing products or services that serve the same purpose. This is the way to “close the loop” by not only recycling waste but also purchasing recycled products, for example. In terms of energy, always understand the relative impact of the product that may be purchased, and look for the Energy Star label. The Energy Star website also offers a comprehensive listing and comparison of products. This and other programs were developed by help consumers with Environmentally Preferable Purchasing. These types of labels are also referred to as “eco-labels” and they represent reliable standards for different types of products and services. There are also web-based resources available for various product categories of “EPP”.

Environmental Protection Agency—EPP: [www.epa.gov/epp](http://www.epa.gov/epp) (General Purchasing)  
Environmental Choice Program: [www.environmentalchoice.com](http://www.environmentalchoice.com) (Multiple Criteria)  
Energy Star: [www.energystar.gov](http://www.energystar.gov) (Energy Efficiency)  
Consortium for energy Efficiency: [www.cee1.org](http://www.cee1.org) (Energy Efficiency)  
Greenguard: [www.greenguard.org](http://www.greenguard.org) (Indoor Air Quality Issues)  
Greenseal: [www.greenseal.org](http://www.greenseal.org) (Variety of Categories)  
WaterSense: [www.epa.gov/watersense](http://www.epa.gov/watersense) (Water Efficiency)  
Waterwiser: [www.awwa.org/waterwiser](http://www.awwa.org/waterwiser) (Water Efficiency)  
Scientific Certification Program: [www.scscertified.com](http://www.scscertified.com) (Recycled Content, and More)  
Forestry Stewardship Council: [www.fsc.org/en/](http://www.fsc.org/en/) (Forest Products)  
Ancient Forest Friendly: [www.ancientforestfriendly.com](http://www.ancientforestfriendly.com) (Paper Products)

# PREVENTATIVE MAINTENANCE WORKSHEET

Year												
Facility Name:						Building / Area:						
Type of Equipment:												
Serial Number:												
	January	February	March	April	May	June	July	August	September	October	November	December
Type A tune-up*												
Type B tune-up*												
Type C tune-up*												
Clean and/or check												
Belt(s)												
Oil Motor(s)												
Register(s)												
Vent Pipe(s)												
Condenser Coil												
Evaporator Coil												
Humidifier												
Filter												
Other:												
* See check list for mechanical contractor's furnace / boiler form for additional information												
Comments:												

# PREVENTATIVE MAINTENANCE WORKSHEET (cont.)

Year			
Facility Name:		Building / Area:	
Type of Equipment:			
Serial Number:		Model Number:	
Type of Review: A, B, or C		A= more than 75% of the items in this list reviewed B= more than 50% of the items in this list reviewed C= more than 25% of the items in this list reviewed	
		Yes	No
			N/A
1. Check for any leaks (i.e., fuel, water, steam, exhaust)			
2. Conduct leak test of heat exchanger, or disassemble and inspect.			
3. Carbon monoxide test of ambient air; note results			
4. Carbon monoxide test of flue gasses; note results			
5. Net stack temperature (Pre___F) (Post___F).			
6. O <sub>2</sub> or CO <sub>2</sub> reading (Pre___%) (Post___%).			
7. Efficiency should be within 5 % of Manufacturer's AFUE,			
or Steady State (SSE Pre___%) SSE Post___%)			
8. Actual input (Pre___kBtu) (Post___kBtu).			
9. Draft test over flame (Pre___) (Post___);			
Draft test at breach (Pre___) (Post___).			
10. Backdrafting?			
11. Check vent system.			
12. Check power supply.			
13. Adequate fuel supply to control valve?			
14. Adjust burner and gas input.			
15. Adjust the pilot light and/or adjust combustible blower (for power blower)			

## PREVENTATIVE MAINTENANCE WORKSHEET (cont.)

	Yes	No	N/A
16. Lubricate fans, motors and pumps.			
17. Check, adjust and/or replace belts, if worn.			
18. Check and adjust thermostat/heat anticipator.			
19. Check blower and high limit controls.			
20. Check pressure regulator.			
21. Adjust burner air shutters.			
22. Check temperature rise (within range on rating).			
23. The following areas should be clean:			
Squirrel cage, Combustion chamber, Cabinet, Heat exchanger, Burner ports			
and fire tubes, Blower housing and motor, Oil Filters, Return air filters.			
24. Floor/wall fire protection.			
25. Condition of tiles/glass.			
26. Duct work (heat runs/return mix).			
27. Proper BTU input.			
28. Wiring condition.			
29. Oil pump pressure set at 100 psi, or per manufacturers recommendations.			
30. Orifice replaced, if necessary.			
31. Ensure proper draft.			
32. Properly operating limit controls/auto fuel safety shut-off.			
33. Turbulators (boilers).			
34. Combustion air opening (clean or dirty).			
35. Stack temperature.			

# PREVENTATIVE MAINTENANCE WORKSHEET (cont.)

	Yes	No	N/A
36. Steam pressure (boiler) on/off.			
37. Water temperature (boiler).			
38. Water treatment (boiler).			
39. Low water cut-off test (boiler).			
40. Safety relief valve test (boiler).			
41. Boiler controls functional.			
42. Outside air temp. reset functional (boiler).			
43. Outside air shut-off functional (boiler).			
44. Three-way valve functional (boiler).			
45. After tune-up, furnace/boiler should be performing within 5% of manufacturers listing.			

Comments:

## Daily

One of the most important things you can do is LOOK, LISTEN, SMELL, and FEEL your building every day. Your senses can tell you if something is “not right” and give you clues about trouble areas. The following areas should be checked often:

1. Observe stack vapor when approaching building.
2. Inspect the furnace:
  - A) Filters
  - B) Belt adjustments
  - C) Burner flame
  - D) Make up air intake
  - E) Humidifier (if attached)
3. Inspect boiler by:
  - A) Checking the water level in the sight glass
  - B) Checking the steam pressure/water temperature
  - C) Looking at the burner flame and combustion dampers
  - D) Checking the operation of the hot water heating pumps
  - E) Draining the water from the air compressor tank and filter element drain bowl
  - F) Scanning valves, piping, tanks and traps for leaks
4. Tour all mechanical rooms and visually check equipment (pumps, fans, air compressors, water heaters).
5. Observe kitchen and food storage rooms, cooler, freezer temperatures, oven pilots, and exhaust fans.
6. Check known problem areas.
7. Check all windows for damage.

## Weekly

1. Equipment rooms, tunnels, attics:
  - A) Inspect all pipes, hangers, valves and traps
  - B) Fill floor drains with water and check for operation
  - C) Inspect fals, ductwork, dampers, air filters and coils
2. Meeting rooms, classrooms, and corridors:
  - A) Check temperatures and thermostats
  - B) Examine doors, windows and lights for condition and operation
3. Roof (weather permitting):
  - A) Check for debris and remove it
  - B) Check and clean all drains
  - C) Examine roof surface and report any problem areas and/or leaks
  - D) Check roof-top equipment for unusual noise, vibration, or overheating
  - E) Notice what equipment is running and if it needs to be on.

Note: Special CAUTION should be taken while on the roof—it is easy to damage the surface. Remember to:

- A) Walk on the walkways when possible
- B) Don't step on blisters, ridges, expansion joints, weak spots
- C) Don't drop anything on the roof; you may puncture it

## Monthly

Check air-cooled refrigeration units for dirty condensers and clean if needed.

## Three Times Per Year

Schedule time to clean the condensers in window air conditioners and refrigerators.

## Annually

All finned radiation tubes should be cleaned.

## MiIPL Purchasing

Purchasing resources have been assembled for members of Interfaith Power and Light. The webpage offers resources for everything from light bulbs to solar cooking and batteries, it can be found online at:

<http://www.theregenerationproject.org/shopipl.htm>

## Lighting, Heating, Cooling, and Electronics

[http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product](http://www.energystar.gov/index.cfm?fuseaction=find_a_product).

Provides information, reviews, and purchasing assistance on numerous products spanning many categories. This one website covers Appliances, Heating and Cooling, Water Heaters, Home Electronics, Office Equipment, Lighting, Commercial Food Service, Roofing (see Other) and much more. There is a plethora of products listed that have met the Energy Star specifications to reduce energy consumption.

## Water Conservation

<http://epa.gov/watersense/pp/index.htm>

Gives research tools on general water conservation, but more specifically bathroom plumbing fixtures and landscape irrigation, including upgrade options and possible considerations. There is a comprehensive list of tested recommended faucets and High Efficiency Toilets with product specifications. A list of High Efficiency Urinals is expected out in the near future. Gives design considerations and strategies for conservation of water used for irrigation.

## Heating / Cooling Design Considerations

<http://www.ashrae.org/>

Offers publications, guides, and general information about heating and cooling equipment, as well as recommendations to meet and exceed current building standards.

## Bathroom Plumbing Fixtures

<http://epa.gov/watersense/pp/index.htm>

For general information regarding bathroom plumbing fixtures including upgrade options and considerations. There is a comprehensive list of tested recommended faucets and High Efficiency Toilets with product specifications. A list of High Efficiency Urinals is expected out in the near future.

## HVAC Systems

- Digital Fancoil Thermostat  
Honeywell T6575B1003  
[customer.honeywell.com](http://customer.honeywell.com)
- VSD fancoil Unit:  
Comfort Plus Drive  
Carrier Corporation  
[www.commercialhvacservic.carrier.com](http://www.commercialhvacservic.carrier.com)

## Insulation

- Rigid Board Insulation  
Manufacturers, Types, Sizes, Properties  
<http://building.dow.com/na/en/products/insulation/rigidfoam.htm>
- Insulating Solutions, Products, Calculators  
Owens Corning Commercial Site  
<http://www.owenscorningcommercial.com/>

## Water Conservation

Dual Flush Retrofit mechanism

- Two-Flush  
Aquanotion Ltd.  
3107 31St. S  
Lethbridge  
Alberta, Canada  
TIK 6T1  
1-866-TWO-FLSH  
[www.twoflush.com](http://www.twoflush.com)

Waterless Urinal

- Kohler Products  
<http://www.us.kohler.com/index.jsp>
- Falcon Waterfree Technologies  
<http://www.falconwaterfree.com/flash.htm>

Ecotech

- [Ecotechwater.com](http://Ecotechwater.com)

## Lighting and Controls

### Lighting:

CFL lamps, High Performance T-8 tube florescent.

TCP lighting (lamps)

Aurora, OH 44202

(800) 324.1496

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

### Lighting Controls / Occupant Sensing:

Lutron (controls)

Lutron Electronics Company, Inc.

Coopersburg, PA 18036

1.888.LUTRON1

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

### Occupant Sensor Lighting:

Occusmart

Lamar Lighting

Farmingdale, New York 11735

1-800-724-7743

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

### High Wattage CFL Bulbs:

Green Electric Supply

<http://www.greenelectricalsupply.com/high-wattage-compact-fluorescent.aspx>