

## Marshfield Fire and Rescue New Central Fire Station Energy Efficiency Design Items

1	Geothermal Heating	Reduction of 8,000 therms from an estimated 18,000 to 20,000 therm usage for a conventional style building. Boiler efficiency will also be at 94%. There is also an Energy Efficiency Rating (EER) of 14 to 17 minimum for this system.
2	Compartmentalization of Ambulance & Station Automobile areas	Energy savings for a bi-fold door opening twice a day is \$532/year for a 7,804 square foot apparatus bay. These compartmentalized bays are 1/5th the size of the main apparatus bay and should have a larger savings for door openings in these rooms.
3	Bi-fold Doors	\$226/per year energy saving for each door opening per day. \$8,848 estimated maintenance savings per year.
4	Photovoltaic Panels	Photovoltaic panels will reduce electrical demand for charging eleven vehicle batteries, medical equipment and two-way radios will reduce electrical demand by up to 10%.
5	Passive Lighting - Low E windows utilized with offices & living quarters located on south - southwest sides of building	Part of original design - no added cost
6	Auto control lighting	The use of natural lighting, low impact fluorescent lighting and computer control, should see a decrease in electrical consumption by approximately 20%.
7	Energy Efficient Precast Walls	12" thick walls (3" concrete, 3" insulation, 6" of concrete) Panelized construction is optimized for tightness and strength.
8	Water Gardens	LEED item to maintain water runoff on the building site along with the environmental aspects of water gardens. The negative ions that moving water releases into the atmosphere help to purify the air. If you've ever noticed that air smells and tastes fresher near a waterfall or just after a rain storm, you have had a firsthand experience of the impact that these ions can have. A water garden produces a continual stream of negatively charged ions that help to remove toxins and impurities from the atmosphere. When you take a deep breath of the fresh, clear air that hovers around your water garden, you will find tangible proof of the fact that your garden is having a positive impact on the environment as a whole. One of the reasons why eco-conscious gardeners are increasingly attracted to water gardens has to do with the idea of conservation. Most forms of plant based landscaping like lawns, flowers, shrubs, or gardens based in soil require constant watering. A lush yard of vibrant green grass can soak up gallons of water each week, especially during the summer months when heat threatens to wilt your carefully tended plants. This sends your household's water consumption through the roof, despite the fact that environmental experts recommend conserving water and using as little as possible. When you create a water garden, you create a self sustaining cycle of hydration that will keep plants alive and well without you having to water them
9	Rain Water Retention Tank - 30,000 Gallon	Sized for a 2 year max storm. Use of this water for vehicle & hose washing along with hose testing will result in an 18% water savings.
10	Cement vs Asphalt - Color	Urban heat islands raise demand for electrical energy in summer. Companies that supply electricity typically rely on fossil fuel power plants to meet much of this demand, which in turn leads to an increase in air pollutant and greenhouse gas emissions. The primary pollutants from power plants include sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), particulate matter (PM), carbon monoxide (CO), and mercury (Hg). These pollutants are harmful to human health and also contribute to complex air quality problems such as the formation of ground-level ozone (smog), fine particulate matter, and acid rain. Increased use of fossil-fuel-powered plants also increases emissions of greenhouse gases, such as carbon dioxide (CO <sub>2</sub> ), which contribute to global climate change.
11	High efficiency - low flow fixtures	Water control low flow fixtures, toilets, showers and appliances reduce water consumption by 22%.
12	Grey water fixtures	In addition to their impact on energy-related emissions, elevated temperatures can directly increase the rate of ground-level ozone formation. Ground-level ozone is formed when NO <sub>x</sub> and volatile organic compounds (VOCs) react in the presence of sunlight and hot weather. If all other variables are equal, such as the level of precursor emissions in the air and wind speed and direction, more ground-level ozone will form as the environment becomes sunnier and hotter.
13	White reflective roof membrane	The Solar Reflectance Index (SRI) is a measure of the roof's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. For example, the standard black has a temperature rise of 90 deg. F (50 deg. C) in full sun, and the standard white has a temperature rise of 14.6 deg. F (8.1 deg. C). The roof specified for this project has an SRI of 84.
14	Solar Water Heater	Reduction in energy costs by 65%