

Practical Guide to Improving the Energy Efficiency of your Religious Building



Faith & the
Common
Good

[DISCLAIMER]

While every effort has been made to provide accurate and complete information, Faith & the Common Good does not warrant the accuracy or efficacy of this information. Faith & the Common Good will not be liable for any loss, costs, damage, or injury whatsoever, resulting from the use of this material.

[Faith & the Common Good is grateful to Manitoba Hydro for their permission to copy and update the original version of the *Improving the Energy Efficiency of Your Religious Building with PowerSmart* document produced in 2005.]

Copyright© 2007 Faith & the Common Good

Supported by



Greening Sacred Spaces — An Eco-Spiritual Project

There are thousands of religious buildings in Canada, each a valuable centre for individual and community spiritual interaction. These sacred spaces (churches, gurdwaras, mosques, synagogues, temples...) represent a hopeful frontier in our effort to address the growing ecological crisis before us all.

When we look at these religious buildings, or any building, there is a growing appreciation that they are much more than simply structures to protect us from the natural environment. Indeed, these buildings can be seen as an integral part of our relationship with the planet, or even the entire Universe. This new (revived ancient) cosmology moves away from a dialectical outer-versus-inner, humans-versus-nature worldview, towards a more holistic understanding of ourselves and the Universe. Rather than just protecting us from the elements, the best sacred building designs can help us interact in inspiring ways with the Creator and creation, and with one another.

Greening Sacred Spaces is about realizing our interconnected relationship with the Universe and its elements. It is a program designed to not just make our churches, gurdwaras, mosques, synagogues and temples more energy efficient and eco-friendly, but also points to ways that these sacred spaces can guide us in our everyday lives, in our homes, gardens, communities, and places of work.

From this everyday perspective, being in contact with the divine is not an abstract other-worldly relationship. Our whole world, built and organic, personal and professional, embodies the divine. All elements, animate and inanimate, are imbued with spirit and are part of the web of creation.

The Earth gives humanity rootedness. It 'grounds' us, feeds us, and shelters us as the walls of our sacred buildings and homes are made from its soil, wood and stone. Water is the lifeblood of every living thing, and we use it to cleanse and bless ourselves. Fire is the divine spark, and the heat and light from the sun, hearth and candle warms and brightens our lives and lifts our spirits. Air is the breath of the Creator. When imbued with incense and the scent of flowers, as it is in many sacred spaces, air literally and figuratively 'inspires' us.

These ancient sacred elements have been tapped by modern technology to offer us very practical ways of living more sustainably. The sun is captured by south-east oriented windows and photovoltaic solar panels; the air is churned by wind turbines; water flows through hydroelectric systems; the earth is tapped for its geothermal heating and cooling properties, while plants are used for 'green roofs' and 'living walls'.

All the elements can be transformed into clean energy systems, taking nothing away and creating no waste. We call this 'renewable energy' and it is one of the processes that will make it possible for humanity to reverse the negative effects wrought by old paradigm building-as-barrier thinking and instead create a truly sustainable environment that will renew ecosystems and heal planet Earth.

1

As many of our sacred spaces are old, with insufficient insulation and out-moded heating, cooling and ventilation systems, and even relatively new buildings are often inadequately insulated and have drafty windows and doors, religious buildings represent a greater-than-average opportunity for energy conservation, greenhouse gas reductions, and overall improvements to the environment. As places where we gather as intentional communities-of-faith, they also provide ample opportunities to enlighten and engage a wide range of citizens in all manner of eco-sustainable Earth care.

Greening Sacred Spaces begins by developing a framework of faith-based environmental consciousness that seeks to understand the sacredness of the Earth and our role in renewing that sacred balance one church, gurdwara, mosque, synagogue, temple and individual at a time.

Table of Contents

Introduction	5
Simple Steps to Reducing Energy Use	6
Reduce Operating Time	6
Lights	6
Natural Gas pilots in Summer	6
Ventilation Systems	6
Heating Systems in Summer	7
Reduce Operating Temperature	7
Domestic Hot Water Systems	7
Refrigerators and Freezers	8
Heating Systems	8
Ventilation Systems	9
Reduce Operating Losses	9
Drafts	9
Insulation	10
Lights	10
Appliances/Equipment	11
General Water Conservation Priorities	11
Leaks	11
Fixtures	11
Toilets and Urinals	12
Faucets	12
Landscaping Best Management Practices	13
Building Systems and Maintenance	14
Building Envelope	14
Energy Saving Opportunities	14
Components and Systems	14
Air Barrier Systems	15
Materials to Use	15
Where to Seal	16
Mistakes to Avoid	16
Insulation	17
Batts or Blankets	18
Loose-fill Insulation	18
Rigid or Semi-Rigid Board Insulation	18
Spray Foam Insulation	19
How Much Insulation is Enough	19
Insulation Installation	19
Cladding	19
Roofing	19
Vapour Retarders	20
Moisture Problems	21
Deterioration	21
How Moisture Accumulates in Buildings	21
Handling Moisture	21
Condensation in Chimneys	22

Heating, Ventilation and Air conditioning (HVAC) Systems	23
Heating	23
Energy Saving Opportunities	23
Furnaces	24
Electric Furnaces	24
Natural Gas/Propane Furnaces	25
Oil Furnaces	25
Condensation Problems	26
Unit Heaters	26
Rooftop Heaters	26
Heat Pumps	27
Boiler Systems	28
Steam Boiler Systems	28
Steam Traps	28
Steam or Water Hammer	29
Water Treatments	29
Best Management Practices for Steam and Condensate Systems	30
Hot Water Boiler Systems	30
Best Management Practices for Boilers	31
Improving the Efficiency of a Heating System	31
Converting Your Heating Source	32
Conversion to a Geothermal Heating System	32
Building Heating System Replacement Requirements	33
Summary of Heating Loads	33
Recommended Specifications for Replacement Boilers and Furnaces	34
Passive Solar Heating	34
Active Solar Air Heating	35
Solar Water Heating	35
Air Conditioning	35
Ventilation	36
Energy Saving Opportunities	36
Natural Ventilation	36
Mechanical Ventilation	36
 Lighting Systems	 38
Energy Saving Opportunities	38
Incandescent	39
Compact Fluorescent Lamps	39
Long Tube Fluorescents	40
T8 Fluorescent	40
Metal Halide (MH) (Standard Technology or Probe-Start)	40
Metal Halide (MH) (Pulse-Start)	41
High Pressure Sodium (HPS)	41
Low Pressure Sodium	42
Lighting Ballasts	42

Water Conservation Priorities	43
Low Flow Toilets	43
Reducing Toilet ‘Sweat’	43
Toilet Prices	43
Rain Barrels	43
Rainwater Harvesting	44
Purchases and Other Ways to Save Energy	45
Office Equipment	45
Paper	45
Refrigerators	45
Dishwashers	45
Laundry Machines	45
Clothes Dryers	46
Saving with Parking Lot Controllers	46
Carpooling	46
Energy Audits	47
Types of audits	47
Do You Need an Energy Audit to Save Energy?	47
Getting Started	47
Baseload Calculations	48
The Simple Walk-through Audit	49
The Detailed Walk-through Audit	49
Develop an Energy Efficiency Plan	49
Appendix — Energy Audit Templates	52
Religious Building “Walk-Through” Energy Audit Form	53
Electrical Worksheet	54
Natural Gas / Propane Worksheet	55
Bulk Fuel Worksheet	56
Lighting	57
Building Envelope	59
Water System	61
Heating, Ventilating and Air Conditioning (HVAC)	63
Office Machines and Equipment	68
Appliances	70
Miscellaneous Appliances	72
Landscape	74