

**Christians and Creation**  
**Energy Efficiency Upgrades at St. Luke's (Part 1)**  
**- 30% Savings within Two Years -**

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In 2003 concerns about escalating heating costs prompted a professional energy audit for St. Luke's Church (1890) and its separate auditorium & hall. With their numerous small extensions, building construction is typical of older churches. There are two separate heating systems, very little or no insulation and lots of cracks.

Documentation, the most important first step for energy reduction, showed that space heating requirements by far outweighed any other energy use. Concern about the energy footprint for the building did not become apparent until after the energy use was properly documented.

**The initial audit** identified the following major considerations, with paybacks of less than 5 years, in order of importance:

- weather-stripping around the doors and windows,
- caulking around windows,
- replacing exit lights with LED bulbs and installing low flow aerators on faucets, and
- insulating the hot water pipes from the gas boiler in the hall plus the hot water tank and the floor over an unheated crawl space.

Church volunteers completed this work between 2004 and 2006 for an estimated 13 percent savings in space heating.

**An extra audit**, done by Church members themselves, revealed even greater potential for savings. The highest priority was the thermostats. A heating contractor had advised us that thermostat setbacks at night were not effective. A web search revealed documents to the contrary and thermostat setbacks were established at 15<sup>0</sup>C nighttime and 19<sup>0</sup>C daytime.

Room use patterns were analyzed by area and the temperatures were selectively dropped as soon as the area was unoccupied. The auditorium was kept at only 17<sup>0</sup>C during the day, because of aerobic activities done in this area, and the Church was kept at 15<sup>0</sup>C all week until used. Secondly, and most importantly, the thermostats were locked with only a limited number of keys available.

The second most important finding was that the thermostat sensors were not properly calibrated. Using an accurate thermometer, the settings were checked after daytime building temperatures had stabilized. This revealed that most thermostat sensors were reading too low - the room temperature was actually as much as 5<sup>0</sup>C higher than what the thermostat read. The thermostats were recalibrated.

Gap sealing was the next most important item. Gaps in the building envelope, where pipes and wires penetrated walls, were large and numerous. Such openings were not found by the professional audit, as it required crawling into restricted areas of attics, crawl spaces and other undesirable areas. They amounted to an area of about 2 full sized doors that provided space for heated air to move from the inside to outside. The gaps were sealed with expanding foam and caulking.

Other problems noticed were openings in wall tops and bottoms that allowed unheated air into the wall systems. While not actually allowing air to enter the building, they acted as a conduit for heat transfer, and the openings were boarded up and caulked. *[Note: if there are mold or condensation problems then these must be fixed as gap sealing can exacerbate the problem.]*

The auditorium ceiling has a plastic vapor barrier that is the only thing preventing warm air from rising through the R20 insulation into the unheated attic space. The vapor barrier, which had fallen down in large sections totaling about 10 square meters in area, was repaired.

Insulation was upgraded over the hall ceilings because there were open spaces under the existing insulation where cold air could blow. The R12 insulation was upgraded to R40 after gaps were sealed thoroughly in the ceiling area and around pipes and wires. This made the building both warmer in winter and cooler in summer.

Finally, the gas fired forced air furnace of the Church is situated in a basement furnace room. The room is vented to the outside because of the need for fresh air for furnace combustion. The space was flooded with cold air that then traveled through cracks into other areas of the basement. The very cold conditions were corrected by caulking and weather-stripping to prevent cold air ingress into livable spaces. In addition, repairs were made to where several of the heat distribution pipes from the furnace had been knocked out of their sockets.

**After the extra repairs were completed our overall savings increased significantly. Upgrades done in 2005 and 2006 yielded average savings of about 25% compared to the previous 5 years (see graph). If the annual temperature differences between years are taken into account, the savings are greater than 30%. About 20 tons of carbon emissions and about \$2300 were saved annually. Thus, a payback of less than one year was achieved with volunteer labour.**

It is our hope that this will encourage other Churches and their members to upgrade their buildings and homes because of the ecological as well as the financial benefits.

