

Special Report: Municipal Buildings

In this era of fiscal restraint, building and retrofitting municipal buildings can be a trying issue for municipal officials. In this Special Report on Municipal Buildings, we look at some of the latest developments in building technology as well as where you can go to get assistance in your construction decisions – whether that assistance is in the area of information or financial aid.



Municipal building retrofits

The Federation of Canadian Municipalities' Municipal Building Retrofits process assists municipal governments in developing comprehensive retrofit programs for their buildings and supports municipal staff by providing customized tools and services throughout the design and implementation process.

Municipal governments manage about 5% of Canada's buildings. This represents about 20 million square metres of space and over \$280 million in energy and water bills.

The benefits of a building retrofit are numerous:

- a significant reduction of utility costs (recouping the retrofit cost within a few years);
- a reduction in system repair and maintenance costs;
- improvement of occupant well being;
- an increase in overall energy efficiency;
- a reduction in the risk of costly emergency repairs;

- the generation of approximately 20 local jobs for every \$1 million invested; and
- the enhancement of safety and productivity in work and community spaces.

The FCM has the expertise and experience to guide municipal representatives through every step of a comprehensive retrofit process. Through a wide range of services and decision-making tools, the FCM will help a municipality develop a business case that identifies potential cost efficiencies and plan a program that meets the needs and goals of a specific community.

The FCM can help individuals overcome barriers, explore financing options and secure senior management and council support. Enrollment in the retrofit program is free.

For more information, call John Purkis at 613-241-5221 ext. 236. ●

FCM offers pair of programs

The Federation of Canadian Municipalities (FCM) offers two programs that may be of interest to municipalities with building concerns.

First, the \$25 million Green Municipal Enabling Fund (GMEF) offers grants for feasibility studies that assess the technical, engineering, environmental and/or economic viability of proposed municipal environmental projects aimed at improving energy or process efficiency in municipal buildings, and water, wastewater, municipal solid waste and public transit systems. Eligible recipients are Canadian municipal governments and/or a person that is a public or private sector partner of a municipality.

Second, the \$100 million Green Municipal Investment Fund (GMIF) provides interest-bearing loans, loan guarantees, and grants to eligible recipients carrying out municipal environmental projects that improve energy and process efficiency in municipal buildings, and water, wastewater, solid waste management and public transit systems.

For information on selection criteria, visit the FCM website at www.fcm.ca. ●

Ottawa announces new \$1 billion municipal rural infrastructure fund

In August, Prime Minister Chrétien, the Hon. Allan Rock (Minister of Industry and Minister responsible for Infrastructure) and Andy Mitchell (Secretary of State for Rural Development and Federal Economic Development Initiative for Northern Ontario) showed how communities across Canada will be able to benefit from the new \$1 billion Municipal Rural Infrastructure Fund.

Said Minister Rock, “Long term infrastructure commitments are key to ensuring that communities, large and

small, are competitive and healthy centres for economic growth, innovation and the well-being of all Canadians.”

The new Fund was designed in consultation with provinces, territories and municipal associations. It is flexible and capable of addressing a wide range of municipal priorities. A component of the Fund targets First Nations’ infrastructure needs.

Federal objectives on climate change, water quality, urban life, and innovation continue to guide project eligibility so that Canadians obtain maximum benefits

from infrastructure funding. The green infrastructure focus will address projects such as water and wastewater treatment infrastructure, municipal environmental energy improvements, public transit infrastructure and solid waste treatment infrastructure. Other eligible categories include cultural, tourism and recreational infrastructure, local roads and connectivity.

For more information, call Infrastructure Canada at 613-759-1107. ●

Fibre-optic fire-detection system

Fire researchers at the Institute for Research in Construction, in collaboration with the University of Ottawa, are studying the feasibility of a new fibre-optic-based fire-detection system. The system is expected to reduce false alarms and provide early detection of fires in areas with restricted access or difficult ambient conditions, such as tunnels, underground stations, telecommunication facilities, and energy plants.

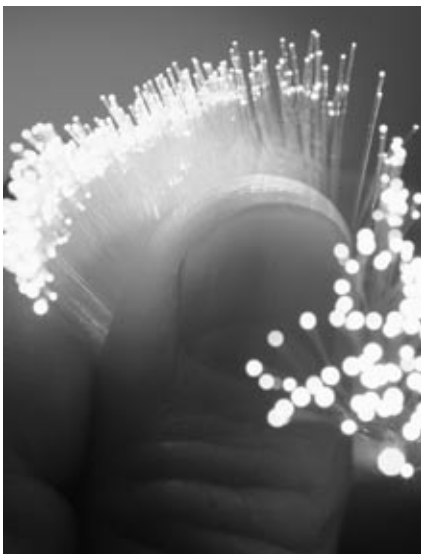
A fibre-optic cable system is much more sensitive to temperature fluctuations than conventional heat detectors. This increased sensitivity means that this system may be able to detect fires earlier than is now possible, or even detect small fires in specific locations. The technology also reduces the problem of false alarms because the system is immune

to many kinds of interference. In addition, the cable is strong, resilient and flexible, and can be directly placed near or inside protected facilities, providing greater accuracy in terms of locating the fire and determining its size.

The research has demonstrated the feasi-

bility of using distributed optical fibre sensors for fire-detection applications. The next step is to study and evaluate the performance of this technology in real fire conditions.

For more information, visit <http://irc.nrc-cnrc.gc.ca>. ●



CMHC offers a HOW-TO for retrofitting municipal buildings

Retrofitting a City: A Guide for Municipalities to Implement a Building Retrofit Program is a concise, 46-page 'how-to' for municipal leaders. Published in April 2002, the manual is available from Canadian Mortgage and Housing Corporation (CMHC). Contact the Corporation through its website (www.cmhc.ca); by writing to CMHC, 700 Montreal Road, Ottawa, ON K1A 0P7; by calling 800-668-2642; or by faxing 800-245-9274.

INTRODUCTION

Municipal governments directly manage about 5% of Canada's buildings (arenas, office complexes, social housing, libraries, and community centres). That represents 20 million square metres of space and over \$1 billion in annual operating costs, including \$280 million in energy and water bills.

Building energy retrofits have the potential to reduce those bills by 20% or more through improvements to infrastructure as well as operating and management practices. In most regions, this can also translate into significant reductions in greenhouse gas and acid gas emissions.

Building energy retrofits should follow the AIM process, which includes the following steps:

- **Audit** – a study of the building and the way it uses energy;
- **Implement** – the implementation measures including engineering, project management, subcontracting, and commissioning; and
- **Monitor** – the tracking of energy savings to be sure they're achieved as expected, and they are sustained.

This AIM process and its steps are described in detail throughout the manual.

The authors reviewed over 35 municipal energy retrofit programs across North America. Four of these were examined in greater detail.

SCOPE AND DELIVERY METHOD

Buildings can be categorized by:

- Ownership (municipal, public sector, private sector, individual)
- Type of use of occupancy (institutional, commercial, industrial, residential)
- Size (small, large)

Some municipalities start with their own buildings, which offers a variety of building types and the ability to develop processes and build a corps of staff with the necessary expertise. Others set a goal of reducing energy use in all buildings within their borders. Retrofit programs can be designed to target any group or type of buildings within municipal boundaries.

Retrofits can be managed and/or delivered in different ways, including:

- In-house resources
- Outside Energy Management Firms
- Outsourced Program Manager
- Volunteers

Choosing the right method of delivering the retrofits is an integral part of the program scope decision. Will only the program management and promotion be done in-house, or will complete engineering and project management also be done by municipal staff? Will volunteers be involved? Will design and construction management be performed by in-house staff or outside consultants?

STAFFING SKILLS

Skills required to manage a municipal building retrofit program include:

- **Political** – report writing, policy recommendations, the ability to make presentations to council, the public, the media, or stakeholders.

- **Marketing** – preparation and execution of a marketing plan, marketing materials, direct market contacts, along with integration with other marketing efforts to recognize individuals and organizations.
- **Technical** – ability to understand technical issues, select outside consultants, and ensure project meets defined standards.
- **Coordination** – work with other civic departments.

FINANCING THE FUNDS

Financing requires consideration of funds for two purposes:

- 'enabling' funds to set up and operate the administration of the program, source outside expertise, and
- 'financing' funds to lend or grant to building owners to undertake retrofits.

In the case of enabling funds, the municipality may be able to provide a base level of staff, and a place for them to administer the program. Other funding sources can be:

- utility partners
- senior levels of government
- retrofit industry associations
- municipal associations
- financial institutions
- a dedicated energy retrofit investment fund

Implementation of a program to retrofit municipal buildings relies on one fundamental principle:

Energy retrofits do not consume internal capital, but will generate sufficient savings to repay any investment. This will result in making funds available for other purposes.

SETTING UP PARTNERSHIPS

Partnerships will keep the project responsive to the needs of the community, and will help maintain the energy and enthusiasm needed to carry on through the inevitable setbacks and difficulties. Partners can contribute financially, administratively, or politically, or they may serve as outreach or liaison associates. Some potential partners include:

Utility partners – They are usually willing to contribute to activities related to their business and are in regular contact with their customers. Also, some utilities operate very extensive demand-side management (DSM) programs that can complement a municipal retrofit program.

Senior levels of government – The federal government has offered many different programs for municipalities to improve or retrofit their buildings. While not as active as Ottawa in this area, provincial governments also offer some programs to help reduce energy use.

Energy service companies (ESCOs) – ESCOs are in business to find and implement long-range solutions to energy management problems. Reduced operating costs and improved performance are provided to facility owners in exchange for a portion of the savings that result. Owners enter into energy performance contracts with no capital outlay and leave the risk of program failure to the ESCO.

Federation of Canadian Municipalities (FCM) – FCM recommends that municipal governments follow an eight-step process for undertaking a program of comprehensive retrofits in municipal buildings. The Sustainable Communities Guide: Municipal Building Retrofits provides assistance for municipal staff to obtain senior management and council support, assess existing information and current energy use, decide what financing and implementation options work best for them, develop the business case, and move forward with implementation and verification of savings. The Guide provides templates, model documents, and a detailed resource manual.

PROMOTING THE PROGRAM

A well-recognized retrofit program whose name becomes a hallmark that immediately identifies it in the mind of the public stands a better chance of success than one whose name is known only by a few individuals

at city hall. Potential participants will want to know that the program is a legitimate enterprise from which they will benefit by becoming involved.

A ‘kick-off’ event with a ribbon cutting is an excellent idea. Invite media and all those who participated in the planning process, as well as its current and potential partners and clients.

A building energy retrofit program can benefit greatly from having one or more champions in the community. They will lead the discussion at council meetings, act as spokespersons at public gatherings, and even help market the program to potential clients.

MONITORING ENERGY SAVINGS

Each program needs a clear process of monitoring energy savings on a project-by-project basis. Some projects may operate on the basis of projected savings by calculation, but this isn’t sufficiently accurate for determining the amount of energy cost savings to be repaid to a loan fund. Additionally, energy savings can be lost over time as good energy management practices are overtaken by other priorities. This can only be managed by monitoring and tracking energy use on a regular basis, and then reviewing the results. ●

New age building design – what is it?

It has been called many things including “green design,” “ecological design,” and “sustainable design.” Basically, it is a school of building design that salutes modes of practice that minimize our impact on the environment and produce healthier living places.

In architecture, there are many ways a building can be ‘green’ and respond to the planet’s growing environmental problems. This can be accomplished while maintaining efficiency, beauty, layouts and cost-effectiveness. There are five basic areas of an environmentally oriented design: Building Ecology, Energy Efficiency, Materials, Building Form and Design.

Building Ecology – Many products and systems used in today’s buildings are actually toxic to humans. They may have been emitting dangerous gases and substances into the air for years. These hazards can be diminished or eliminated if, during the design (or redesign) process, adjustments and substitutions are made in the materials used. Also, HVAC (heating, ventilation and air conditioning) systems can be designed to offer maximum levels of fresh air and minimum levels of mildew and mould build-up.

Energy Efficiency – With solar technologies and solar heating methods, as well as thermal massing and insulation systems, energy can be returned during even the most extreme conditions. Energy use detectors and reflectivity can be used effectively and lighting and electrical fixture selection can dramatically reduce the use of electricity.

Materials – Some materials are ‘harder’ on the environment than others. Some wood species come from destructive forestry practices. Some materials require extensive processing and produce toxic waste. By consistently using low-impact materials, we will make things easier on the planet.

Building Form – The form of a building can respond to adjacent land form, vegetation and climate patterns. Incorporated into a design may be recycling systems, lifestyle enhancing layouts, reduced flow water fixtures, and indoor planting areas.

Design – When considering design, we should ask ourselves: “What are we leaving those that will follow us?” Buildings with longevity, ease of use, reuse, and beauty will require less energy, less repair, and more value in the future.

These approaches comprise a new approach to building. Without them, we leave a poor legacy to future generations. With them, we hold out the possibility of a regenerated and healthy environment.

Retrofit success stories



In the last decade or so, there have been a number of positive stories in the area of municipal buildings. Here are a few of these stories.

Quebec City, QC

Since 1991, Quebec City has been proactive in educating employees and residents on how to protect the climate. The city also launched

an energy management program that saved over \$4.9 million from 1993 to 1999. The main goal of the program was to increase energy efficiency in municipal buildings and the streetlights.

The Building & Equipment Maintenance Department retrofitted 23 buildings, including arenas, community centres and the water treatment plant. Energy management

software was used to monitor the energy efficiency of these buildings.

In 1996, the city, along with a provincial agency (l'Agence de l'efficacité énergétique), launched a program to educate municipal employees on energy conservation. The city actually created software that rates the energy efficiency of buildings. The data for each individual building includes current real estate value and types of retrofits needed to improve efficiencies.

Kingston, ON

The City of Kingston initiated a new Official Plan consisting of a series of smaller plans that include the Downtown Action Plan, Transportation Plan, Waterfront Strategy, Urban Growth Strategy, Cycling & Pathways Study, and the Heritage Plan for Buildings. The latter plan is aimed at the city's private and public buildings. It provides guidelines and incentives for the preservation, inventory and improvement of historic buildings.

Some immediate spin-offs of the Heritage Plan are that it created architectural guidelines for downtown; developed a tax incentive program for heritage buildings; created an inventory of municipal heritage properties; produced a Building Conservation Master Plan for municipal buildings; and estimated current and future renovation costs for municipal buildings.

With the Heritage Plan, heritage buildings have increased in value, there is an increased awareness of these heritage assets, and there is an increase in renovations versus demolitions.

Maple Ridge, BC

In 2002, the District of Maple Ridge approved a five-year energy and environmental management plan by its Facilities Operations Department aimed at several municipal facilities. The first building to get attention, the Maple Ridge Operations Centre, will be completed in September. The HVAC and lighting systems are being retrofitted and upgraded by a BC Hydro Power Smart Building Performance Program team headed by Coral Engineering Ltd. Other members of the team are Quantum Lighting, Gas Protection Systems Inc. and Professional Mechanical Ltd.

According to a study by BC Hydro, the facility's annual operating energy budget of \$42,000 will be reduced by approximately 25%. In addition, these eco-efficient measures will reduce the facility's CO₂ emissions by 78,876 kg/yr and NO₂ emissions by 91 kg/yr.

At a projected cost of \$53,000, more than \$10,000 in annual energy and maintenance cost savings are anticipated.

Other buildings being studied for retrofitting include the leisure centre, RCMP office, Municipal Hall, the family recreation centre and three fire halls.

Mississauga, ON

The City of Mississauga is delighted with its Energy Management Program, or EMP. That's because it will save \$600,000 per year in utility costs from buildings, with corresponding annual savings of 4,000 tonnes of greenhouse gas emissions.

To establish a baseline of energy information, the city purchased a software system from TEAM Energy Auditing Agency in England. The software records energy consumption and produces reports that are sent to each facility manager. A manager can then compare the building's performance with similar operations. Initially, energy audits were performed on eight facilities. These audits led to recommendations for conservation techniques, automating energy controls and, in some cases, the need for major renovations. A business case analysis was done for each facility to assess the return on investment. Improvements yielding a three-year payback or better were done first.

Retrofits were completed on the Tomken Arena, two libraries, Mavis Works, and the transit garage. The retrofits included computerized building automation systems, energy-efficient lighting and controls, infrared heaters, and ventilation controls.

Between 2000 and 2002, improvements to existing facilities, and the construction of new energy-efficient facilities saved \$220,000 in utility costs.

The city is committed to looking at innovative ideas. It is currently looking for new sources of green electricity such as biomass and wind power.

Drumheller, AB

Between 1993 and 1997, the Town of Drumheller achieved long-term financial and environmental benefits with its retrofit program called Building Energy Savings Today, or BEST. BEST was designed to promote long-term energy and water conservation, and resulting cost savings in municipal buildings, water and sewage treatment facilities, local businesses and residential homes. BEST was completed in two stages – retrofits to municipal buildings, followed by retrofits to private residences.

Initial energy audits determined the usage of electricity, gas and water in municipal buildings. All major facilities were subsequently retrofitted (town hall, pool, civic centre, library, fire hall, water treatment plant and arena). Retrofits included solar heating panels, more efficient lighting systems, and new water conservation devices.

Capital investment cost for this first stage was \$530,000 (the second stage cost \$420,000). Overall, the program achieved all of its objectives. The town estimates it

has cut energy consumption by 1.2 million kWh. This translates into a reduction of 750 tonnes of coal and about 1,500 tonnes of CO2 emissions. Energy savings from the municipal building retrofit in the first year were \$52,000. Subsequent annual savings were estimated at between \$60,000 and \$65,000. ●