

# Building Envelope News

## Envelope retrofit = energy savings

### History provides the proof

The facts are in. Thirty years ago very few energy engineers believed or understood how tightening the building envelope could help them improve building energy efficiency. Today they do.

#### Why?

First, because almost all energy performance contractors have included envelope retrofits on many of their projects.

Second, because they've got the savings they needed.

And third, they've come to appreciate the resulting 'soft' benefits that add value: improved occupant comfort, the visibility of upgrades such as tighter operable openings and greater controllability of the indoor environment.

In this first 'ESCO Special Issue' of Building Envelope News, you'll see evidence of how envelope and air barrier retrofit have become a mainstream measure for all stakeholders in the global energy efficiency and environmental improvement mission.

You'll also be able to read about how future growth is being supported by Canam Building Envelope Specialists Inc.'s ALCAP energy forecasting software (see sidebar page 3). More and more energy engineers are using ALCAP calculations to make decisions in favor of envelope upgrades. They know that in addition to direct savings, 'if the envelope is tight and the ventilation right,' heating and cooling systems can be downsized by as much as 20 per cent and the control system can do its job more efficiently.

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- Honeywell Clinton Climate Initiative
- ALCAP proves ROI
- An A+ for Massachusetts school retrofit
- Hospitals, fire halls, social housing: coast-to-coast payback from retrofits



## Michigan School District saves \$3 million

### Johnson Controls retrofit Dearborn public schools

In the automotive heart of Michigan, Johnson Controls and the Dearborn School District have been retrofitting building envelopes at a rapid rate.

There are over 30 buildings in the District and for the past eight years, Johnson Controls and the Dearborn School District have been working together to make their buildings more energy efficient. Over time, the project has evolved into a significant partnership: since 2002, the District has saved over \$3 million thanks to upgrades to utility

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## 2009 Outlook

### Energy efficiency upgrades a priority for government economic stimulus

In the US and Canada, governments at all levels have made it clear that improved energy efficiency of buildings is critical. The new Obama administration, for example, has singled out 75 percent of US federal building stock as a target for immediate energy efficiency improvements, along with 10,000 schools and 2.5 million low-income homes. In Canada, \$2 billion is budgeted to repair, retrofit and expand facilities at post-secondary institutions and \$323 million over two years for the restoration of federally owned buildings.

"These buildings are in a market sector that has delivered thousands of examples of proven energy savings," says Bill Boyd, Canam's VP Contracting Services. "It is where we perform most of our envelope and air barrier retrofit work for performance contractors. The global financial crisis and credit crunch present challenges for everyone, but all indications are that growth in this sector will accelerate."

NAESCO, the National Association of Energy Service Contractors, has worked tirelessly to make sure that such projects are a priority. In its December 2008 recommendations to the Obama Transition Team, NAESCO stressed: "Funding for accelerated energy efficiency investments should be included in the stimulus bill because large-scale investments in energy efficiency provide a greater level of economic benefits in both the short and long term than virtually any other kind of stimulus investment and substantial environmental benefits at no additional cost."

## Michigan School

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systems, the buildings and other energy-related initiatives.

The project started as an electrical and mechanical-system upgrade, says John Crawford, project development team leader with Johnson Controls. But when the benefits of air sealing were explained to the client—that it will help optimize the performance of new mechanical systems—they agreed to improve building envelopes as part of the project. It was a decision that soon proved its merit, says Crawford.

“Once the school board started seeing the results, they were very open to continuing with the retrofits.”

When the retrofit was approved, Crawford contacted Bill Boyd of Canam Building Envelope Specialists Inc. to see if he could recommend a local affiliate to work on the sub-contract for the air sealing.

Boyd worked closely with Crawford to identify a qualified contractor from Canam’s ZERODRAFT® division to work on the retrofit.

Key elements of the project to restore building envelope performance included door sweeps, roof-wall intersections, windows and doors, roof penetrations and garage doors.

The project has been a great success and a win-win relationship for everyone. The District is saving significant amounts of money and their pleasure with the work has led to further partnerships with Johnson Controls.

A recent press release from Dearborn Public Schools announced that Johnson Controls and the District are collaborating to secure ENERGY STAR® certification for all the schools in its mandate.

“Based on observations of other Districts, Dearborn has been truly cutting edge by getting involved with these energy saving projects in 2002,” the release states. “With higher energy costs, we are now reaping increased benefits of conservation while other Districts are scrambling to begin what we have already accomplished.”



## Hospital cures its gaps and holes Honeywell cuts Sunnybrook’s energy bill by 17%

Sunnybrook Hospital is a major 22-building campus on Bayview Avenue in Toronto. Along with its off-campus orthopaedic branch downtown, the hospital has been working with Honeywell Building Solutions to reduce its total annual energy bill from \$13 million to \$10.7 million, a saving of more than 17 percent.

Honeywell’s lead engineer on the Sunnybrook project, Derek Pienczak has successfully worked with Canam on many projects over the years. “We engaged Canam to survey all of the buildings,” says Pienczak. “Our goal was to combine energy efficiency improvement with a variety of facility upgrade measures.”

Canam’s envelope audit proposed a number of retrofit measures, including sealing air leaks in the building envelope, especially around windows and exterior doors. Many leaky floor

penetrations were identified leading to an extensive program of sealing between floor service and ductwork penetrations to prevent airflow and cross-contamination between floors.

“These measures allowed us to improve the performance of the environmental conditioning system as well as occupant comfort,” says Pienczak.

“The contribution of these envelope retrofit measures may be a small percentage to overall energy efficiency,” says Pienczak, “but it is justified because it completes the project. If you leave leaky windows and doors, it makes it harder for the mechanical system to do its job. Sealing these openings, particularly the doors and windows, deliver an immediately noticeable and visible benefit to occupants of the building.”

## Clinton Climate Initiative

### Honeywell asks Canam to check London buildings for leaks

London, England is a target city on the Clinton Climate Initiative (CCI) list. As part of its global program to support CCI, Honeywell Building Solutions is working with *Transport for London* to define upgrades for its portfolio of office buildings of varying ages in the city centre.

Last fall, a team of Canam building envelope assessors helped identify potential air sealing measures that would result in energy savings in 22

buildings, totaling about 1 million square feet.

Measures recommended include, for example, weatherstripping the stairwell doors in one 19-story building and sealing the fire hose cabinet risers at each floor to reduce stack effect. Two thirds of the buildings will benefit from reduced air leakage control around leaky windows and nearly all need exterior door weatherstripping.

# ALCAP proves ROI

## Bridging the gap with energy-use forecasting software

Calculating the energy performance benefits from retrofitting the building envelope used to be a 'dark art.' It was more complicated and less well understood than a lighting retrofit or a mechanical system upgrade.

Not any more, thanks to ALCAP, Canam Building Envelope Specialists Inc.'s proprietary Air Leakage Control Assessment Procedure. This breakthrough in energy-use forecasting software is helping to build a bridge between the proven principles of building science and the real world's insistence on economic justification.

ALCAP's accuracy in forecasting energy savings from envelope retrofit has been tested many times in the field over the last few years. Today Canam uses this sophisticated software on nearly all energy performance contract projects.

It provides detailed analysis of pre- and post-retrofit building envelope performance as they relate to energy consumption and air leakage.

ALCAP automatically creates clear and easy-to-understand reports that detail the results—including return on investment—that can be achieved

with air sealing work. It is consistently accurate within 10 per cent of the forecasted result.

An ALCAP report details six important forecasts:

1. Energy cost savings and payback
2. Fuel use savings—for space heating, make-up air and cooling
3. Electricity savings—by season, peak and off-peak
4. Potential reductions in HVAC equipment sizing
5. Contribution to energy savings from air sealing measures—from windows, exterior and interior doors, building envelope joints, shafts and other penetrations
6. Approximate greenhouse gas emission reductions

If you want to implement a large-building retrofit armed with acceptably accurate forecast results that will allow you to see the financial, environmental, and structural benefits of building envelope retrofit, then ALCAP is the method of choice.

## An A+ for Massachusetts retrofit Siemens seals and compartmentalizes technical school

Franklin County Technical School in Turners Falls, Massachusetts, had become extremely energy inefficient over its thirty-year life. According to Mark Buzzell, project developer with Siemens, the building had almost nothing done to it, save a window replacement a few years ago.

So when the call went out for a contracting partner on the project, Siemens answered, knowing they could access high-quality subcontracting help on the project via companies such as Canam Building Envelope Specialists, Inc.

"It was a massive job," explains Buzzell. "For them and for us."

The school retrofit involved building envelope upgrades such as air

sealing and weatherization, as well as replacement of the mechanical systems and controls. The entire outer perimeter of the building where the wall meets the roof had "huge gaps" in it, as described by Buzzell, and required two-part foam air barrier and insulation material to close the gaps.

Given the nature of the school, internal compartmentalization also played a significant role in the retrofit. Separating the school's different "shops" (i.e. welding) from other areas was an important consideration, to keep fumes and airborne particles from transferring to other areas in the school.

The clients' main consideration was replacing the 30-year-old mechanical equipment, says Buzzell, but once he

explained the benefits of air sealing and compartmentalizing the building as well, the customer was quick to see the light, he says.

"I told them the best return would be to first tighten the building envelope—get it weather-tight and decrease the amount of holes in it. Then we could move forward with replacing the mechanical equipment. They brought a third-party commissioning agent in to help them with the process and he totally agreed with [the building envelope retrofit] part of the project."

Although the project is still ongoing, the client is already happy, having seen the quality of the materials involved, says Buzzell.

"They're very impressed with the weather-stripping and all of the materials provided. The products are very high quality and are going to last a long time."

Once the project is wrapped up, the client will bring back the commissioning agent to verify the work, a move that Siemens always encourages. "It helps because it makes the client more comfortable with the work. The great thing is, they are basically ending up with a brand-new building without the same level of cost and disruption."



## Envelope retrofit

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Increased confidence in specifying envelope retrofit measures is backed by research at the highest level. The National Institute of Science and Technology (NIST) study: *Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use* found "Infiltration in commercial buildings can have many negative consequences including reduced thermal comfort, interference with the proper operation of mechanical ventilation systems, degraded indoor air quality, moisture damage of building envelope components and increased energy consumption."

Energy performance contractors, who have enjoyed savings from these measures for since the ESCO business started up in the 1980s, say that they are looking for simple paybacks of five to ten years. Take a look at just a few examples and see how Canam is consistently achieving even better results:

- A 1989 retrofit of two electrically heated multi-unit residential buildings in Ontario, Canada, resulted in annual consumption savings of 165,000 kWh and reduction of peak demand in winter months of 50 to 85 kW. Savings equaled 18.5 percent of total space heating costs.
- Building envelope upgrades performed for a Syracuse, NY, school district delivered US\$52,000 annual savings with a five-year simple payback.
- Forest Laneway, a three-tower, 1000-plus unit apartment complex in Toronto, Canada, saved over \$200,000 in energy costs in the first year following an envelope retrofit.
- Gravenhurst High School, Ontario, Canada completed an air barrier retrofit for \$6,740, with an forecast payback of 5.6 years, but saved \$4,893 during the two coldest months in the first winter alone.
- Thurlow Township, a rural municipality about two hours east of Toronto, Canada, achieved a 15-month payback, saving more than 49,000kWh of electricity in the first year.



## Hospitals, fire halls, social housing MCW gets coast-to-coast payback from retrofits

Janet Williams, project manager with Toronto, Ontario, based MCW Custom Energy Solutions sees building envelope retrofit measures as low-cost and low-risk with a high-return for MCW's energy performance contracts.

Building envelope measures include new weather stripping for doors and windows, window caulking, new insulation for roof wall intersection and sealing of penetrations through the building shell.

MCW has a broad base of institutional and other clients. Notable recent projects where Canam Building Envelope Specialists Inc. has completed energy efficient envelope retrofits include Campbellford Memorial Hospital, Campbellford, Ontario, Northern Manitoba Regional Health Authority in northern Manitoba, the Toronto Community Housing Corporation and Fire Halls and soon to be Police Stations for the City of Toronto.

"What's great about working with Canam crews is their ability to work with our clients in a similar fashion as we do," says Williams. "Canam takes great pride in their work. They always consult with the client to review process and timing to minimize disruption before work

begins. We have never had a problem with a dissatisfied client; in fact if there is ever a need to return to site, Canam gets back immediately to review its work and implement any required remedies."

Often MCW is dealing with older facilities that have been constructed in phases. Williams describes how the roof wall joints often leak unless they are designed and constructed not to leak. Canam finds that roof/wall joints are a major air leakage problem in this type of building and has perfected techniques over the years to seal and insulate at this point.

MCW typically implements a comprehensive energy efficiency project including everything from lighting and HVAC systems to water conservation. "Most of our clients are looking for a blended program within a 10- to 20-year simple payback," says Williams. "A typical building envelope retrofit measure for us would have a six to eight year simple payback which results in a reduction in heating energy."

Recent work at the City of Toronto fire halls has led to instantly measurable energy savings thanks in part to implementation of a building envelope retrofit program.

# BEN

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