

upgrades&efficiencies

Surface



Rewards

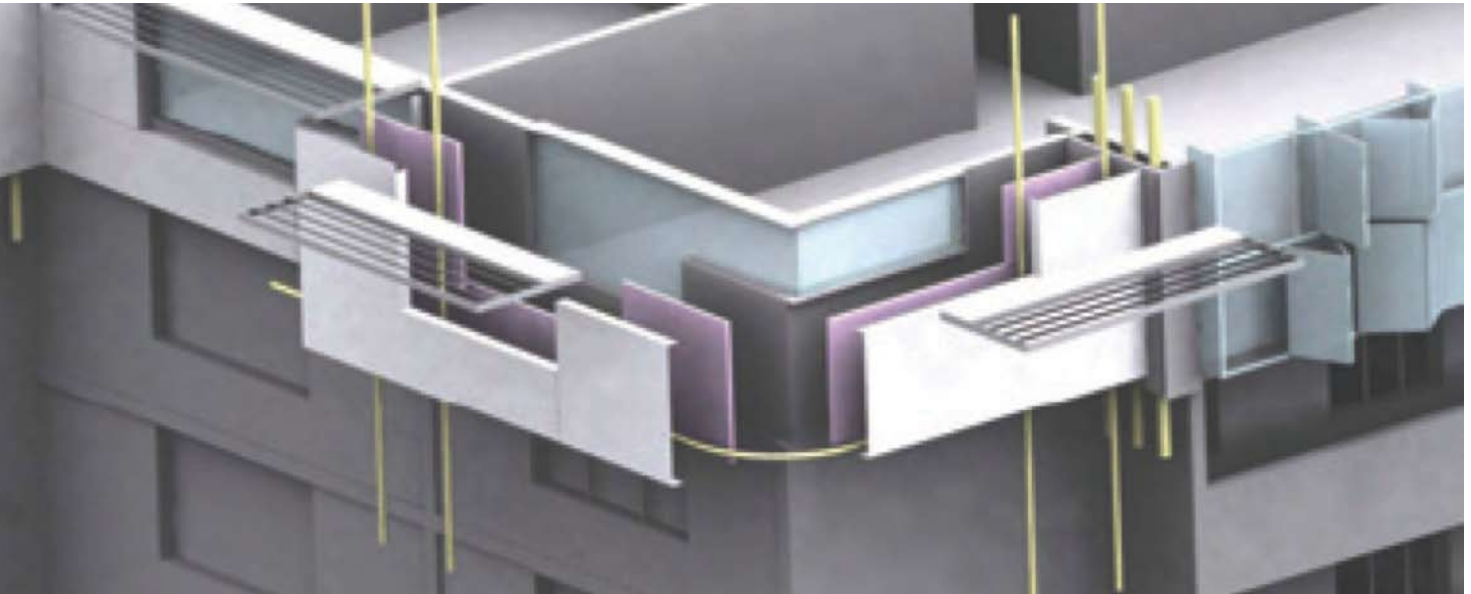
Retrofit Competition to Renew Old Towers

By Ron Dembo

The recently announced Zerofootprint Building Re-Skinning Competition offers the world's largest architectural prize to date in an effort to advance new methods and technologies for retrofitting buildings. The Z-prize will be shared by the winning building owner and architectural team for a comprehensive retrofit project delivering energy efficiency, smart technology, aesthetic upgrades and best return on investment. The following report outlines the motivation and goals for the competition – Editor.

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THE HORIZON OF almost any major city features a collection of aging tower blocks punctuating the skyline. Built largely after World War II to fill an urgent need for housing and office space, the design often paid little heed to aesthetics or energy efficiency.

Yet, buildings are responsible for more than 40% of North America's greenhouse gases (GHGs), while consuming more than 70% percent of the electricity generated around the continent. In contrast, SUVs account for just 3% of emissions in North America.

Technology, materials and design have improved dramatically since many of these buildings were constructed, but tearing them down and rebuilding would create enormous environmental damage. It would consume monumental amounts of resources, including concrete – one of the most carbon-intensive materials to produce. It would also take decades, if not centuries, to turn things around – time that is not available in light of climate change.

Well established retrofitting techniques such as changing heating sources from electricity to gas, double-glazing windows, fitting low energy lights etc. could be implemented quickly and more cost-effectively. For example, a project in Washington, DC is investing \$175 million to retrofit 400 government and private buildings with the aim of saving \$36.5 million per year in energy costs.

Even so, this approach is not without challenges. In older developments, for

example, ventilation is often restricted to hallways with the assumption that apartments will be ventilated by default through leaky unit doors. New difficulties arise when these buildings are made airtight.

Traditional retrofitting can be expensive when measured against the energy efficiency it achieves and many observers suggest US President Obama's program is ambitious in seeking efficiency gains of 25% within five years.

RE-SKINNING RATIONALE

Re-skinning is another option that promises greater energy efficiency gains and comes with a number of other benefits as well. It could give old, unsightly, energy-leaking buildings a brand new face.

If approached in a holistic manner, re-skinning can seal energy leaks and provide a new layer of insulation. In conjunction with traditional retrofitting, such as installing geothermal heating and cooling systems, it can maximize efficiency gains – particularly since new materials offer the possibility of making the skin part of the heating and cooling system itself.

A new skin can hide added piping, cabling and other services, making retrofitting quicker and cheaper. It can alter the face of a building, as well as its interior conditions, making it easier on the eye and a more comfortable and flexible place to live or work.

Old tower blocks blight the landscape of some of the world's most beautiful

cities. Toronto has 2,500 towers, New York has 5,000 and similar drab structures proliferate in the suburbs of Paris, London, Moscow and Tokyo. Re-skinning could give them a design and decorative makeover and enhance the aesthetics of the urban environment.

Many of these old urban tower blocks were soundly built and have been well maintained, but they were designed in an age when energy prices were low and stable and when the science of building envelopes was more rudimentary. Since then, architecture has evolved from structures that rely on the exterior walls to hold them up to buildings designed around a solid core or shell. Worn, failing exteriors now provide a flexible platform for changing a building's skin.

Without a thermal barrier between a building's inner core and the outside weather, heat will simply radiate out during colder months. The concrete layers between floors and the concrete walls and balconies that adorn many old apartment blocks are conduits that allow heat to escape in the winter, while capturing and storing it in the summer.

SOLID BASE FOR NEW TECHNOLOGY

Re-skinning can provide a thermal break between a building's internal environment and the vicissitudes of the elements outside. As with double glazing – where air is trapped between two panes of glass to provide a layer of insulation – the



Images courtesy of Zerofootprint

over-cladding of a re-skinned building protrudes from the original wall, thus creating an effective thermal barrier in the gap between.

This gives the building a newly insulated concrete core that can act as a thermal storage device that captures and stores the building's heating or cooling rather than wasting it. Creating a gap between the old walls and the new skin also makes a useful space for piping, ducting and cabling to deliver more efficient services to a building.

It can be a nightmare of disruptive drilling, banging, re-plastering and reconfiguring trying to fit new pipes and ducts inside existing units, whereas fitting the services on the outside is simple, unobtrusive and causes minimal inconvenience to building occupants. This also reduces the capital costs and hastens the payback on investment.

Fibre optic cables could be installed at the same time to deliver high-speed internet access that could promote more telecommuting and video-conferencing – reducing travel and greenhouse gas emissions. This would also be a means to incorporate intelligent control software and fit older buildings with sensors and monitors for more efficient operation of HVAC systems, lighting, water heaters, electric window blinds, etc.

A further step could connect all the domestic or office appliances to the network as well, and introduce variable electricity pricing. Appliances such as

washing machines or clothes driers could be programmed to operate when power is cheapest, also helping to reduce peak loads on the electrical grid.

Building exteriors can now play a role in electricity generation or water heating systems. Research suggests that photovoltaic materials or the integration of geothermal heating and cooling can improve the energy efficiency of buildings by an additional 20%.

Ted Kesick and Ivan Saleff of the University of Toronto calculate that re-skinning deteriorating buildings in Ontario alone could prevent 142 million tonnes of carbon emissions, and save \$60 billion in energy costs, \$3.6 billion in avoided generation infrastructure and \$10.2 billion in health care costs. It could also provide more than 800,000 jobs and create a green energy industry worth \$95 billion annually.

A CALL FOR INNOVATION

There have been a number of successful re-cladding and re-skinning projects leading up to Zerofootprint's Building Re-Skinning Competition, but often they have focused on a single objective – simply improving the appearance or the energy efficiency of a building. Even where there have been multiple objectives and successful outcomes, the solutions have tended to be customized and one-offs. Methodologies, technologies and materials are needed that can apply in a wide range of circumstances and could

be scaled up into major renovation programs in a cost-effective manner.

The Zerofootprint competition aims to draw the best minds and talents to the challenge of re-skinning buildings, and engage the best architects, designers, engineers and builders in rethinking the built space to the benefit of people and the planet. In recognition of the scale of the challenge and the importance of the solution, the initiators of the competition hope to award the biggest prize ever for an architectural competition.

Five chosen finalists will be monitored for a period of three years after the completion of the retrofit to examine and compare how they perform in practice. Ultimately, the Z-prize will be awarded to the building that has most reduced energy consumption per square foot, averaged over the three years of monitoring. This will be measured from a baseline of the audited total energy used by the building in its last year of operation prior to the retrofit.

Competition submissions will be accepted until September 1, 2009. For more information, see the web site at <http://communities.zerofootprint.net/building-re-skinning-competition/> ■

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