



# Energy & Waste Conservation

- **Heritage buildings store embodied energy—the energy invested in them to date.**
- **Rehabilitating heritage buildings conserves more energy than constructing a new building**
- **Heritage conservation reduces construction and demolition wastes**

## When a heritage building is demolished, the stored embodied energy goes to waste

The energy used in the lifecycle of a building, called the *embodied energy*, includes all the non-renewable energy consumed :

- Initial energy - to acquire, process, manufacture, and transport building materials, and construct the building ,
- Recurring energy – to maintain and repair the building ,
- Operating energy - to heat, cool, ventilate, and light the building , and
- Energy to demolish and dispose of the building.

A Canadian study examined the total life-cycle energy-use in a 4,620m<sup>2</sup> (50,000 ft<sup>2</sup>) three-storey, generic office building. On average, the total embodied energy of such a building increases by 56.5% by the time it is 25 years old, 144% by the time it is 50, and 325% by the time it is 100 (see graph). If the building is demolished, this embodied energy will be wasted.

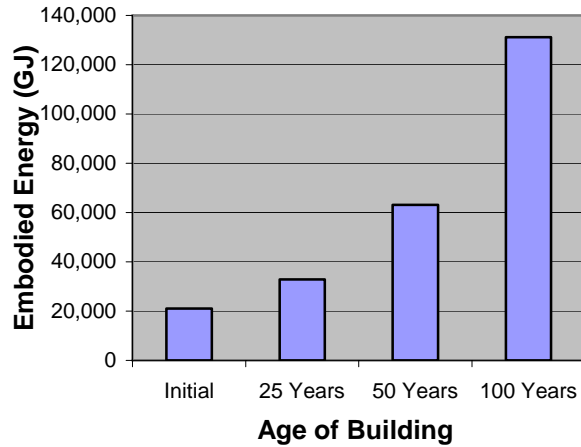
*(Building and Environment, 1996)*

## Maintaining the structure conserves a large portion of a building's embodied energy

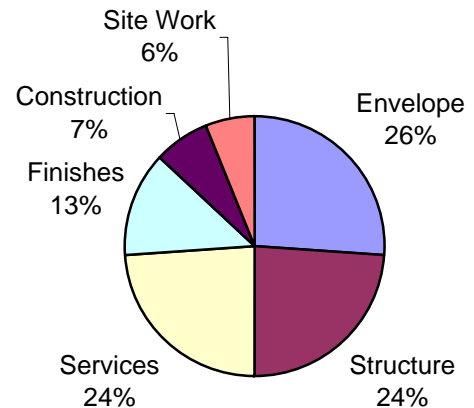
The same Canadian study found that 50% of a building's initial embodied energy is due to the structure (foundation and beams) and envelope (exterior walls) (see pie chart). When a building is rehabilitated, the embodied energy of these components is conserved.

*(Building and Environment, 1996)*

**Total Initial and Recurring Embodied Energy of an Office Building**



**Average Total Initial Embodied Energy**





## The rehabilitation of heritage buildings conserves embodied energy

A study of the Angus Technopole Building, a Montreal factory built in the early 20th century, compared the energy costs associated with rehabilitation and adaptive reuse of the building as a residential complex to the energy costs of demolition and the construction of a new building on the same site. It illustrated that rehabilitation required 5,169 Gigajoules (Gj) of energy, while demolition and new construction required 13,734Gj of energy. Restoration, in other words, would require 8,565Gj less energy than demolition and building anew.

*(The Athena Institute, 2004)*

## Heritage conservation reduces the waste stream to landfills

- The majority of buildings are demolished before they are 30 years old.
- 35% of buildings are demolished due to area redevelopment, which can be attributed to a lack of effective planning.
- 22% of buildings are demolished due to the building being “no longer suitable for the needs,” which can be attributed to a
- lack of imagination in adaptive reuse ideas.
- If these buildings were refurbished for new uses, Canada’s waste stream could be reduced by about 6%.

*(Forintek Canada Corp., 2004)*

In 2000, 12% of Canada's waste disposal was from construction and demolition sources.

*(Statistics Canada, 2005)*

Depending on methodology, region and year of assessment, estimates of construction and demolition waste in Canada range from 10-33%, with a conservative estimate of about 20%.

*(Heritage Canada Foundation, 2001)*

## Resources

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