Retrofits, Refrigerants, and Carbon Performance

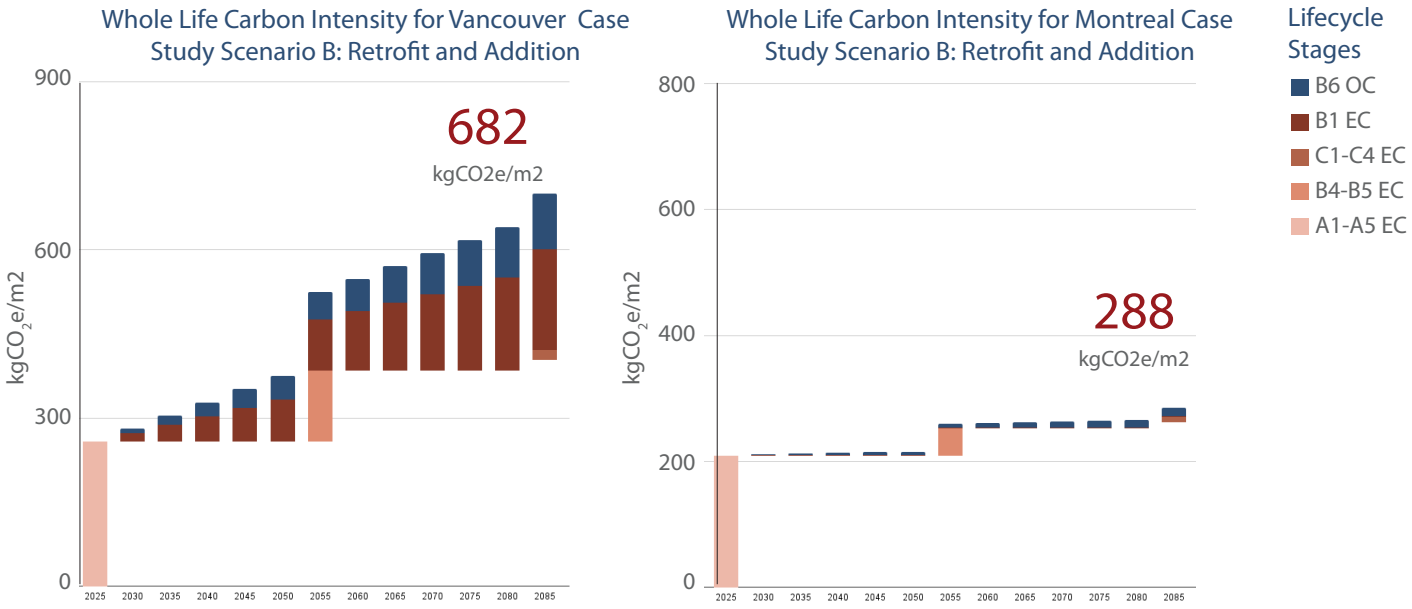
CAHP | ACECP

Briefing Note **07**

Mechanical systems are a significant driver of both embodied and operational carbon in retrofit projects.

In buildings served by clean electricity grids, refrigerant choice, not energy efficiency, can become the dominant whole-life carbon variable. When an existing building undergoes alteration, the new provisions in National Building Code (NBC) 2025 Part 10 and National Energy Code of Canada for Buildings (NECB) 2025 Part 13 require that HVAC and service water heating systems meet updated energy performance standards.

As grids across Canada decarbonize and embodied carbon requirements enter future codes, mechanical engineers have an increasingly critical role in shaping a project's total carbon outcome.



These graphs show the significant difference refrigerant specification can make to whole life carbon emissions. The Vancouver residential retrofit (left) specified R-32 refrigerant which is currently typical for residential scale buildings as R-410A is phased out (B1 denoted by the dark brown bar). In comparison the Montreal office building (right) specified R-454B, which has a much lower GWP impact over the 60-year analysis period.

Excerpts from Unlocking the Value of Existing Buildings. This briefing note is part of a series summarizing key insights from *Unlocking the Value of Existing Buildings: a new approach to codes for carbon, culture and cost.*
The full report is available here: cahp-acecp.ca/learning-resources/

Call to Action for Mechanical Engineers

Match System Selection to Local Grid Carbon Intensity

- In regions with low-carbon electricity grids, the operational carbon benefit of marginally higher-efficiency equipment is minimal. Embodied carbon in the mechanical system, particularly refrigerants, becomes the more important variable.
- Early assessment of available mechanical room space is critical, as constraints directly determine what system types can achieve code compliance.
- In heritage buildings, select systems that avoid penetrating or obscuring character-defining elements. Ductless and hydronic distribution strategies can often minimize physical intervention while meeting energy performance requirements.

Electrify and Recover Heat Wherever Feasible

- Specify heat pumps as the default heating and cooling strategy to meet performance targets in National Building Code (NBC) Part 10 and National Energy Code of Canada for Buildings (NECB) Part 13. Gas-fired backup should only be considered where peak electrical capacity is a demonstrated constraint.
- Incorporate energy recovery ventilation in all residential and office retrofit projects. Heat recovery significantly reduces heating energy demand and is achievable in both ducted and ductless configurations.

Specify Low Carbon Refrigerants

- Refrigerant leakage over a building's service life can represent the single largest embodied carbon contribution from a mechanical system, in some building types exceeding the contribution of envelope and interiors combined. Design for leak minimization.
- Specify low-GWP refrigerants as a default and evaluate ultra-low GWP alternatives where safety and application constraints permit.

Engage With Emerging Retrofit Codes

- Anticipate mandatory refrigerant GWP thresholds and leak-rate requirements in future codes and begin advising clients on refrigerant strategy now.
- Advocate for performance-based mechanical compliance pathways in retrofit contexts and contribute technical expertise to National Model Codes Committee processes through professional associations.

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