

Envelope Performance Pathways for Retrofits

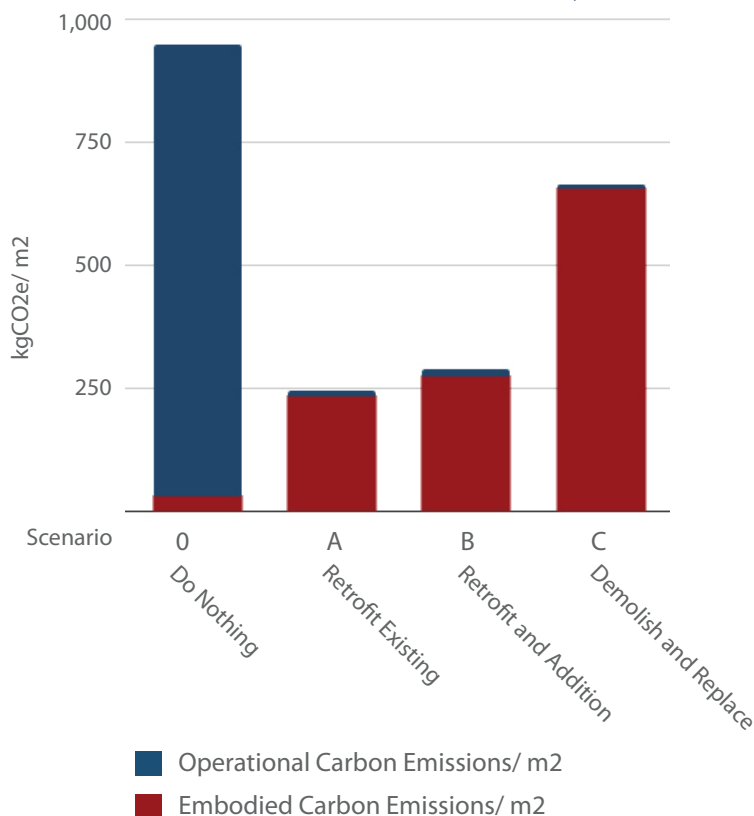
Briefing Note 08

Building envelopes are a critical lever for reducing whole-life carbon.

Retaining and upgrading existing walls, windows, and roofs preserves the embodied carbon already invested in a building while avoiding the emissions, costs, and waste associated with premature replacement.

Performance verification and National Energy Code of Canada for Buildings (NECB) Part 8 whole-building energy modelling further enable energy code consultants to demonstrate compliance through overall building performance, supporting adaptive reuse and targeted envelope upgrades instead of prescriptive full replacements.

Embodied and Operational Carbon Overview for Montreal Case Study



This comparative Whole Life Carbon graph shows the enormous difference in operational carbon over time by electrifying the building, alongside targeted envelope upgrades in the two retrofit scenarios. To balance embodied and operational performance of the envelope no additional insulation was added to the existing uninsulated brick walls, but the 80-year-old windows were replaced. Comparatively, in the new build (Scenario C), the improvement in operational performance is marginal and completely offset by the embodied carbon associated with all new materials and construction.

Call to Action for Building Envelope and Energy Code Professionals

Analyze Performance of Existing Conditions

- Conduct a thorough envelope assessment to identify what can be retained versus replaced to meet a balance between embodied and operational carbon.
- Use thermal scans, air leakage testing, and targeted openings to uncover concealed conditions and reduce uncertainty during design and construction.
- Windows are critical to building performance. Assess condition of existing windows and consider opportunities for repair before full replacement.

Focus Thermal Upgrades Where They Matter

- Strategically prioritize envelope improvements that deliver the greatest operational carbon savings while saving embodied carbon.
- Instead of full replacements, consider selective upgrades like air sealing, secondary glazing, window improvements, or targeted insulation to reduce heat loss and preserve existing materials.
- Use airtightness testing, thermography, and on-site verification to commission the envelope and ensure it performs as designed.

Balance Envelope performance with Electrification

- Electrification is often the most effective strategy for decarbonizing operational emissions if the project is in a province with a clean grid based on renewable power generation.

Use Performance-Based Compliance Pathways

- Using National Energy Code of Canada for Buildings (NECB) whole-building energy modelling (Part 8 performance path), energy code consultants can demonstrate compliance based on overall building performance rather than prescriptive envelope requirements.
- This approach allows existing envelope assemblies to remain in place where appropriate, while targeted upgrades and system improvements achieve the required energy performance outcomes.

