PEMBINA institute

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Codes Canada
National Research Council of Canada
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(Submitted via Codes.publicreview@nrc-cnrc.gc.ca and comment form with Personal Reference Number 1584054756031)

Dear Canadian Commission on Building and Fire Codes:

Re: Carbon metrics in codes and alignment with energy disclosure tools

- **Proposed Change 1527** (NECB17 Div.A and Div.B, various)
- **Proposed Change 1617** (NBC15 Div.B 9.36.1.3)
- **Proposed Change 1608** (NBC15 Div.B 9.36.5)

Summary

• The National Energy Code for Buildings (NECB) and the National Building Code (NBC) should include greenhouse gas intensity metrics, in addition to the current energy efficiency metrics.

• The NECB and the NBC should include a cap for the embodied carbon associated with buildings. These metrics should be developed and added to the tiered energy performance requirements in the next revision.

• To facilitate assessment of ongoing performance, builders of all new Part 3 buildings and eligible Part 9 buildings should be required to create and set up an Energy Star Portfolio Manager account for the project.

The National Energy Code for Buildings (NECB) and the National Building Code (NBC) are critical for Canada to achieve its greenhouse gas (GHG) reduction targets, and to advance the building sector's ability to provide energy efficient, low carbon, and climate resilient buildings.

The Pembina Institute is supportive of the introduction of tiered performance requirements in the codes. However, we recommend that operational carbon intensity metrics be added to the upcoming edition of the codes, and that embodied carbon metrics be developed for inclusion in the next revision. We also recommend that code compliance be better aligned with energy disclosure tools such as Energy Star Portfolio Manager and EnerGuide.

Greenhouse gas intensity metrics

The tiered pathways developed for NBC2020 and NEBC2017 should be modified to include explicit greenhouse gas intensity (GHGI) metrics in order to better align code outcomes with the objectives of the Pan-Canadian Framework on Clean Growth and Climate Change. In light of the federal government and more than 450 Canadian municipalities declaring a climate emergency, it is incumbent on the Canadian Commission on Building and Fire Codes (CCBFC) to provide a regulatory framework that enables municipalities and other authorities having jurisdiction (AHJs) to drive new construction towards near zero carbon as soon as possible.

The current approach focused solely on energy efficiency does not achieve this central objective. An analysis of the GHG implications of the BC Energy Step Code, which is also fuel neutral, concluded:

> [W]hile the Step Code is an effective tool for driving significant emissions reductions in select building types and configurations, it can nevertheless result in buildings that continue to emit significant emissions over their lifetime. In short, the Step Code's focus on energy efficiency does not guarantee the level of emissions reductions necessary to drive emissions to zero or near-zero levels. Building designers can pursue mechanical system options that result in significantly higher GHGIs, potentially hampering the Province's ability to realize CleanBC's future vision of zero emissions buildings.
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> While the energy efficiency of buildings is greatly improved, the implementation of the Step Code can nevertheless result in significant variations in the total GHGI of different building, even at higher steps. Depending on mechanical heating systems selected, GHGI varied by:
>
> - an average of 91% for Part 9 buildings, and
> - an average of 92% for Part 3 buildings.[1]

Adopting a set of GHGI targets alongside energy efficiency metrics in the National Building Code would provide AHJs with the necessary tools to ensure emissions reductions are achieved when implementing the NBC and National Energy Code for Buildings. This approach has already been implemented by the cities of Vancouver and Toronto, and is under consideration for inclusion in the BC Energy Step Code.

Setting GHG emissions targets that are both practical and chart the simplest path towards near zero carbon targets will require some regional adaptation. AHJs could be provided a range of meaningful targets and work with their provincial or territorial counterpart to assess the most appropriate thresholds to use for different archetypes and situations (e.g. at time of rezoning).

[1] Integral Group, *Implications of the BC Energy Step Code on GHG Emissions*, prepared for the Ministry of Municipal Affairs and Housing (2019), 4. http://energystepcode.ca/app/uploads/sites/257/2019/11/BC-Step-Code-GHGI-Report_Nov-2019.pdf

We further recommend that the CCBFC work with the provinces and territories to clarify a methodology allowing for the adjustment of emission factors to better represent how the GHG intensity of electricity and natural gas distribution are expected to evolve over the lifetime of the building, and to clarify how secured long-term procurement contracts for clean electricity and/or renewable gas could be used for compliance with GHG intensity metrics.

Retrofitting existing buildings to reduce their GHG emissions to near zero by 2050 will already be enough of a challenge. Now that we have a clear understanding of the climate emergency, and of the consequences of inaction, it is paramount we ensure new buildings are designed to be connected to low carbon fuels from the get-go. We should not allow them to further add to the retrofit burden. When in a hole, one must stop digging.

Embodied carbon

To lower GHG emissions of the building sector, the National Building Code should include a cap for the embodied emissions associated with different building types. This is particularly important as buildings become more energy efficient and energy grids become cleaner. For buildings constructed between now and 2050, the embodied emissions are estimated to count for nearly half of the total emissions of a building.[2] The share of embodied emissions in buildings' lifecycle will continue to grow as operational emissions are further restricted.

Including embodied carbon caps in the NBC will ensure all building projects account for the embodied emissions of their design and construction choices from the early phases. Studies show that choice of materials and design alternatives significantly impact the embodied emissions associated with a building. For example, a study of a low-rise wood-frame residential building and a single-unit wood-frame raised bungalow in a North American context indicates that the embodied emissions of a building with these archetypes could range from 170 kg-CO_2e/m^2 to 415 kg-CO_2e/m^2 of net emissions.[3]

The NBC could include fixed threshold values for different building types, or a normative methodology for defining threshold values on a project level.[4] Some studies show preference towards the latter approach, while others recommend using a combination of both approaches.[5]

[2] Bionova Ltd., *The Embodied Carbon Review: Embodied Carbon Reduction in 100+ Regulations and Rating Systems Globally* (2018). http://www.embodiedcarbonreview.com

[3] Chris Magwood, *Opportunities for CO_2 Capture and Storage in Building Materials* (2019). doi:10.13140/RG.2.2.32171.39208

[4] Embodied carbon caps are often reported as the weight of carbon dioxide equivalent emitted per square metre of a building (i.e. kg-CO_2e/m^2). See: United Nations Environment Program, *Common Carbon Metric for Measuring Energy Use & Reporting Greenhouse Gas Emissions from Building Operations* (2009). http://hdl.handle.net/20.500.11822/7922

[5] Zahra Teshnizi, *Policy Research on Reducing the Embodied Emissions of New Buildings in Vancouver* (Zera Solutions, 2019). https://vancouver.ca/files/cov/cov-embodied-carbon-policy-review-report.pdf

There are variety of assessment methodologies and standards,[6] databases of construction materials and products,[7] and tools[8] that could be used for calculating the embodied emissions associated with a building. To ensure assessment quality and consistency, the National Building Code should give direction regarding what assessment methodology and standard need to be followed, and what databases and tools are acceptable to use for building projects. Numerous jurisdictions in the world (e.g. California, Netherlands, France, Austria, Norway, Belgium, Finland, and Switzerland) have developed regulations, policies, and programs to lower the embodied emissions associated with buildings.[9] In Canada, the City of Vancouver has proposed a target of a 40% reduction in embodied carbon by 2030 as one of its six "big moves" to address the climate emergency.[10]

Alignment with disclosure tools

To achieve the intended outcomes of the model codes, it is recommended that a mechanism be created for the reporting and disclosure of energy, emissions, water, and waste. This would provide a method for tracking and reporting, and increase the availability of data for performance benchmarking.

We support the intent of Proposed Change 1608, aiming for a better alignment of Section 9.36.5 with the EnerGuide Rating System — though we will leave it to those working more closely with the tool to comment on the efficacy of the proposed changes.

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[6] Currently, the most robust and commonly used standards for construction Life Cycle Analysis (LCA) are developed by the European Committee for Standardization (CEN; e.g. EN 15804 and EN 15978) and the International Organization for Standardization (e.g. ISO 21930). The North American building industry has been mainly using the CEN standards to harmonize LCA analysis across the sector.

[7] Life Cycle Inventory (LCI) and Environmental Product Declaration (EPD) databases are used to estimate the resource flow in and out of the system throughout the life cycle of a building and the consequential environmental impacts. Ecoinvent (www.ecoinvent.org) and GaBi (www.gabi-software.com) are two of the main global-level LCI databases. In Canada, the Athena Sustainable Materials Institute has a LCI database with about 200 construction materials in its library; the International Reference Centre for the Life Cycle of Products, Processes and Services (CIRAIG) has partnered with Ecoinvent on the development of a Canadian LCI database (www.ciraig.org). EPD data for more than 6,000 construction products are accessible globally (see: infogram.com/47216efb-7256-4a5e-acc3-04ce046cbdf8).

[8] Whole-building LCA tools that currently exist vary with regard to the standards (e.g. published by ISO and CEN) that they are aligned with, their regional applicability, and the scope of Life Cycle Analysis they are capable of doing. In North America, the Athena Institute's Impact Estimator for Buildings (calculatelca.com/software/impact-estimator) and KT Innovations' Tally (choosetally.com) are currently available and commonly used. One Click LCA (www.oneclicklca.com) by Bionova Ltd. and eToolLCD (etoolglobal.com) are two other tools available globally.

[9] For more information on embodied carbon-related regulations, policies, and programs for the building sectors of various countries around the world, see *The Embodied Carbon Review*.

[10] City of Vancouver, *Climate Emergency Response* (2019). https://council.vancouver.ca/20190424/documents/cfsc1.pdf

We also recommend NEBC2017 be amended to require the builder or developer to pre-populate the Energy Star Portfolio Manager profile for the building and to provide that information to the long term owner and, if requested, to the AHJ. Architects and developers have easy access to the building-form metrics (e.g. gross floor area, irrigated area, expected occupancy, etc.)[11] that must be inputted in Portfolio Manager to provide context for the operational data (energy and water consumption). Building owners and operators have a much harder time collecting this data, which leads to erroneous or incomplete data entry when they are using the tool for voluntary or mandatory disclosure. Such requirements are currently in place in various municipalities in the Lower Mainland of B.C.[12] Having a code requirement for this pre-population of Portfolio Manager by designers nationally would facilitate the implementation of the universal labelling and benchmarking policies committed to in the PCF.

Conclusion

In closing, we would like to express our gratitude for the important work of the CCGFC in developing the regulatory tools that will shape not only the future of our construction industry, but also the livability of homes and buildings in the face of the climate crisis. We acknowledge the challenges the code writing community faces as the role of building codes in Canada rapidly evolves from codifying commonly implemented best practices to proactively shaping construction practices to meet urgent social objectives. We encourage you to consider not only how the codes must change to meet these objectives, but also how the assumptions, workflows, and practices of the code writing process must evolve to serve this new mandate and adapt to rapidly evolving policy landscapes. Nothing important is easy. We thank you for this ongoing transformation.

Yours sincerely,

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[11] See the Energy Star Portfolio Manager website:
https://portfoliomanager.energystar.gov/pm/dataCollectionWorksheet

[12] For example, see the Part 3 policies for the cities of Surrey and Port Moody:
- https://www.surrey.ca/files/Part3EnergyStepCode.pdf
- https://www.portmoody.ca/en/business-and-development/resources/Documents/BC-Energy-Step-Code-Requirements---Part-3-Buildings.pdf