Efficiency Canada: Public Review of Proposed Changes to the 2020 National Model Codes

November 28, 2023

c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6
https://www.efficiencycanada.org

Facebook: facebook.com/EfficiencyCanada
LinkedIn: linkedin.com/company/efficiency-canada
Instagram: instagram.com/efficiencycanada

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

Public review of proposed changes to the 2020 National Model Codes

First released in March of 2022, the National Energy Code for Buildings (NECB) and the National Building Code (NBC) make up the foundation for Canada's first national tiered energy codes. These model codes, alongside the National Fire Code, National Farm Buildings Codes, and National Plumbing Code, are developed on a five-year cycle. Technical requirements are developed by code development committees and approved by the Canadian Board for Harmonized Construction Codes (CBHCC). These proposed changes are then made available for a two-month public review and comment period.

This public review period is now open and runs until December 18, 2023. It provides an opportunity for those in the buildings sector and other interested parties to review and comment on the proposed changes. Feedback can be submitted via written comments, and commenters can note their support/lack of support for the proposed changes, with or without comments through the CBHCC's online comment form. Comments gathered are then sorted and analyzed by Codes Canada staff, and a draft resolution is provided to the responsible code development committees, which may recommend that the CBHCC:

- Approve the proposed changes for publication,
- revise the proposed changes for publication,
- defer publication pending further development – subject to subsequent public review, or,
- withdraw the proposed code change.

After reviewing the draft resolution, the CBHCC decides which changes will be published in the next edition of the National Model Codes. To better help navigate the proposed changes and their impact on energy efficiency, this article offers an overview of the proposed changes, below.

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

Proposed changes to the NECB

The NECB was Canada's first national standard for building energy performance. It was introduced in 1997 as the Model National Energy Code for Buildings and later renamed the National Energy Code (NECB) for Buildings in 2011. The NECB applies to what are commonly referred to as Part 3 buildings, large residential and commercial buildings exceeding 600 m^2 in building area or exceeding three storeys in building height.

Proposed change 1839: application of the NECB to the alteration of existing buildings

Canada's strengthened climate plan, *A Healthy Environment and a Healthy Economy*, saw the federal government commit to continuing work with provincial and territorial governments to develop and publish a new model code for alterations to existing buildings by 2025[1]. This code, Alterations to Existing Buildings (AEB), is based on the most recent National Energy Code for Buildings (NECB 2020).

This proposed change modifies the application of the NECB generally, (Parts 3 to 8 and 10) and introduces the newly proposed Part 11. Part 11 is to contain technical requirements for the alteration of existing buildings. This change is expected to provide greater consistency in the technical requirements for the alteration of existing buildings and increase the level of safety and building performance of those buildings. It is also expected to close the energy performance gap between new and existing buildings through the use of triggers (based on the scope of the work and the changes being made) that determine whether code requirements, particularly those that increase the building's energy performance, apply to an alteration. Proposed alterations can be exempt if they are considered a maintenance task, for example repairing or replacing a part or component.

Projects not considered to be exempt can be either a minor or major alteration based on a set of triggers that include: systems upgrades, space reconfigurations or additions. Minor alterations will see code requirements limited to the project area, whereas major alterations will see requirements apply to all directly affected

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

systems and potentially systems indirectly affected. The AEB is also expected to reduce confusion related to the degree to which the unaltered portion of the building must meet the AEB requirements, and facilitate compliance enforcement. Similar requirements will extend to the NBC (See proposed change 1812 in this document).

Support.

Proposed change 1820: new greenhouse gas emissions objective and functional statement in the NECB description

Guided by the 2021 federal mandate letters committing to develop a net-zero emissions building code by 2025, and on advice from the provinces and territories the CBHCCs predecessor, the Canadian Commission on Building and Fire Codes (CCBFC) outlined the need for an objective related to limiting GHG emissions and associated technical requirements in the National Model Codes. All code requirements must be linked to the building code's objectives and, as such, proposed change 1820 will enable provincial and territorial regulation, and support provincial, territorial and federal GHG emissions reduction targets and climate action plans. Operational GHG emissions will be addressed in the 2025 national model codes while technical requirements for embodied GHG emissions are expected to be addressed in the 2030 national model codes.

Support with comment:

While we support the addition of a new GHG emissions objective and functional statements we urge the CBHCC to, as an interim step towards mandatory requirements, consider a reporting/measurement only requirement for the embodied carbon of building materials in the national model codes by 2025. Doing so will put in place an immediate path to quickly reducing those emissions. By signaling that cutting material emissions from new buildings is both a building code and societal priority, Canada's national model codes would provide the long-term certainty needed to accelerate the widespread use of, and confidence in, Environmental Product Declarations and the Life-cycle Analysis process, both of which are needed to effectively measure embodied emissions in buildings. This

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

approach could take similar form to that of the City of Vancouver's Zero Emissions building by-law's administrative bulletin 2023-001-AD which requires project proponents to submit a completed embodied carbon design report and supporting documents. Advancing this critical measure will have the effect of fostering greater transparency and accuracy and accelerate action in this critical area by at least half a decade and provide municipalities with a much-needed tool to address building sector emissions.

Proposed change 1813: "existing building" and "heritage building"

Proposed change 1813 introduces two new terms to the NBC and NECB, existing building and heritage building. These additions are intended to clarify the differences between a new building constructed to meet the requirements of the current building code and a building constructed to meet the requirements of previous building code editions. These definitions are:

1. Existing building - a building that was constructed more than five years before the effective date of this Code (the current building code in place).
2. Heritage building - an existing building that is formally recognized by a federal, provincial, territorial or municipal authority for its heritage value.

To better understand what AEB requirements will be required and applied, the term 'existing building' must be clear and a defined term. Because 'heritage buildings' may be impacted or adversely affected by applying some AEB requirements, either in building performance or in their 'heritage value', heritage buildings are exempt where work done to the existing heritage building may compromise its operation or heritage value.

Support.

Proposed change 1821: thermal bridging requirements in the NECB

This proposed change updates the thermal bridging requirements, the conditions that occur when a building component conducts heat from the exterior/interior to the interior/exterior of the building, in the NECB to reflect new modeling and standards.

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

This proposed change updates two referenced standards:

- CSA Z5010:21 “Thermal bridging calculation methodology” - a method of modeling thermal bridging using two- or three-dimensional thermal simulation to reflect a more accurate determination of heat loss at junction, and
- ASTM C1199-22, “Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods” - a method to determine the thermal properties of fenestration.

This proposed change also harmonizes the requirements between the NECB and NBC Section 9.36, thereby clarifying potential confusion when using the NECB compliance for NBC Part 9 buildings.

Support with comment:

While PCF 1821 is a welcomed addition to the NECB, we urge the CBHCC to work with relevant standards associations to develop a referenced standard similar to the BC Hydro Building Envelope Thermal Bridging Guide for analysis of assemblies and components to ensure bridging at component intersections is included in that analysis.

Proposed change 1724: application of lighting requirements

This proposed change extends the application of NECB Part 4 to lighting that is located on the building site. This proposed change will ensure all lighting for the building site, including those separate electrical services installed for lighting the building site and not connected to the building's electrical service, fall within the scope of NECB requirements for lighting power density and control.

Support.

Proposed change 1832: new performance metrics for small single-phase air conditioners and heat pumps

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

This proposed change introduces new energy metrics for small single-phase air conditioners and heat pumps, and to align those metrics with those recently introduced by the US Department of Energy (DOE). Those changes build on previous metrics (EER, SEER and HSPF), but use different test conditions that are considered to be more reflective of real world conditions. Larger air conditioner and heat pump units and three-phase models are not affected by this amendment.

These changes ensure that there are no discrepancies between the NECB and the Canadian Energy Efficiency Regulations, 2016 (EER), which followed changes made to the DOE metrics made in 2023.

Support.

Proposed changes to the NBC

Established in 1941, the NBC first introduced energy compliance requirements, known as Section 9.36, in 2012. Section 9.36 is specifically intended for Part 9 buildings. These are considered small buildings with a floor area under 300m^2 and residential buildings with footprint less than 600m^2 and whose height is three storeys or fewer storeys. The NBC includes requirements for regulated energy uses including space heating, space cooling, ventilation, lighting, service water heating, motors, and other end-uses.

Proposed change 1843: new greenhouse gas emissions objective and functional statement in the NBC

Canada's 'objective-based' code system ties the requirements of the model code to five objectives: safety, health, accessibility for persons with disabilities, fire and structural protection of buildings, and environmental impact. The model codes' requirements can be considered as the minimum acceptable measures required to adequately achieve these five objectives.

Guided by the 2021 federal mandate letters committing to develop a net-zero emissions building code by 2025, 2022 saw the Canadian Board for Harmonized Construction Codes (CBHCC), approve the policy and technical work needed to

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

directly address emissions and thus better support Canada's Net-Zero Emissions by 2050 objective. As a result, this proposed change adds a new code objective to "limit the probability that, as a result of the design or construction of the building, greenhouse gas emissions will have an unacceptable effect on the environment."[2]

The addition of a greenhouse gas emissions objective and functional statement to the NBC will facilitate the addition of provisions that require newly constructed buildings to incorporate low-emissions equipment and appliances, in all new buildings across Canada.

Support.

Proposed change 1812: application of the proposed NBC Part 10 to the alteration of existing buildings

While the NBC has some existing application to the alteration of existing buildings, technical requirements to comply with the NBC are subject to interpretation by the authority having jurisdiction. To eliminate any potential confusion about the application of these requirements or the scope of work required, a new Part in the NBC is proposed. Part 10 applies to the alteration of existing buildings or parts of existing buildings and defines consistent requirements, the application of this set of requirements, and any appropriate relaxations. See this document's overview of Proposed Change 1839 for a more detailed description of how the AEB will apply technical requirements to existing buildings.

Support.

Proposed change 1823: thermal characteristics of fenestration and doors

This proposed change limits the maximum solar heat gain coefficient for fenestration and doors based on the fenestration and door area to gross wall area ratio. It seeks to limit the risk of overheating that may occur when the building's windows have a high solar heat gain coefficient (SHGC) and a high door area to gross wall area ratio (FDWR). This change to Article 9.36.2.7. of Division B of NBC 2020 corrects code language that previously directed users to choose either the

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

overall thermal transmittance (U-value) or Energy Rating (ER) path to comply with the Code requirements on the thermal characteristics of fenestration and doors.

Solar heat gain coefficient (SHGC) is the fraction of solar radiation transmitted through a fenestration, and released as heat inside a home. The lower the SHGC, the less solar heat it transmits. When areas of high solar heat gain are combined with significant solar exposure, for example in buildings oriented east-west, this combination may lead to overheating and cause an increase in the use of mechanical cooling, and associated energy use (particularly when a high SHGC has been used to increase solar heat gain during energy modeling to achieve compliance).

In the prescriptive path, there are currently no explicit limitations on high solar heat gain from fenestration, which can allow for the selection of high solar heat gain fenestration that is compliant with the current requirement but results in high energy usage for cooling, occupant discomfort, and the potential for mechanical cooling to be added after the building is constructed.

Support.

Proposed change 1664: option for insulation under ducts (factory constructed buildings)

Buildings constructed off-site may be unable to or may be challenged to meet the existing effective thermal resistance requirement for insulation under trunk ducts installed below insulated floor framing, and outside the building's thermal envelope. Proposed change 1664 corrects an oversight in the Trade Off path by setting a minimum RSI value, allows for reduced levels of insulation under trunk ducts installed under insulated floor framing. This proposed change ensures consistency in the allowable permitted reduction in insulation levels when the duct is installed outside the building envelope. There is no energy performance penalty associated with this proposed change.

Support with comment:

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

While supporting this proposed change, we do encourage additional measures be taken to ensure that any exposed ducts outside the building envelope, including those with increased levels of insulations, are protected from wind washing and other factors that may diminish the effectiveness of the HVAC system.

Proposed change 1833: new performance metrics for small single-phase air conditioners and heat pumps

In order to maintain alignment with Energy Efficiency Regulations, 2016 (EER), as amended by SOR/2022-265 (Amendment 17), this proposed change introduces new energy metrics for small single-phase air conditioners and heat pumps. These metrics are similar to the previous ones (EER, SEER and HSPF), but use what is considered to be more realistic test conditions. Larger units and three-phase models are not affected by this amendment. This proposed change will reduce confusion related to meeting code requirements, and alleviate challenges associated with compliance enforcement.

Support.

Proposed change 1814: removing the NLA airtightness metric

In its current form, the code allows for airtightness levels to be measured in both normalized leakage area at a reference pressure of 10 Pa (NLA10) and the normalized leakage rate at a reference pressure of 50 Pa (NLR50). Because code users find the NLR50 more useful and applicable for compliance and comparison, this proposed change removes the normalized leakage area (NLA) metric. Code users still have the option to use both remaining air leakage metrics NLR50, and air changes per hour at a reference pressure of 50 Pa (ACH50).

Support.

Proposed change 1834: interpolation of energy conservation points

This proposed change provides energy conservation points for energy conservation measures with values that fall between those listed in NBC Tables 9.36.8.5. to 9.36.8.7. This will ensure that code users are credited with energy

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

conservation points that better reflect the energy savings of their chosen energy conservation measure. The granularity of energy conservation measures and points means that code users can more easily demonstrate compliance with their desired tier.

Support.

Proposed change 1889: energy conservation points for fenestration and doors

As currently provided, the NBC does not offer energy conservation points for fenestration and doors with an overall thermal transmittance value (U-values) lower than 1.22 W/(m^2×K), but does credit the higher efficiency of these products in the performance path. This proposed change rectifies the inconsistency between the prescriptive and performance compliance paths by offering additional energy conservation points for higher-performing fenestration and doors.

Support.

Proposed change 1888: updates to energy conservation points for airtightness levels

This proposed change resolves a previous error in the assigned energy conservation points for airtightness levels in the prescriptive trade-off path of the 2020 NBC. Previously, incorrect points were assigned for airtightness requirements using the guarded and unguarded methods. This proposed change also updates the modeling approach used to calculate the points for different energy conservation measures. The new approach models 240 archetypes in all climate zones to determine the appropriate energy conservation points and does not model a heat-recovery ventilator in the reference house. As a result, existing energy conservation points were updated to avoid potential discrepancies between the modeling rules to determine the existing points needed to comply at higher tiers, and the points assigned for energy conservation measures.

Support.

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

Proposed change 1836: gas-fired furnaces

This proposed change would establish the number of energy conservation points assigned to gas-fired furnaces with performance levels that exceed the minimum performance required by Energy Performance Tier 1. Failure to assign energy conservation points to gas-fired furnaces as specified would prevent Code users from accumulating the energy conservation points associated with the energy savings gained from installing a high-efficiency gas-fired furnace, unless the performance compliance path is used.

Do not support with comment:

As the BC Energy Step Code (ESC) has shown, stringent energy performance targets such as those provided by the 2020 model codes are not a driver for mechanical system selection. While compliance with the ESC's requirements can be met with any type of heating system, there is a significant variation in GHGI at each step[3]. According to the 2019 *Implications of the BC Energy Step Code on GHG Emissions* prepared for the BC Building and Safety Standards Branch, the GHGI for a large single family dwelling at the highest tier using an electric heat pump is 93 per cent lower than the same building using an all-gas heating system. Given the trajectory of electricity grid emissions in several provinces, the continued use of fossil fuel space and water heating equipment in newly constructed buildings will effectively lock in fossil fuel equipment in those buildings long past Canada's 2030 and 2050 net zero commitments. We encourage the CBHCC to reconsider the building codes' traditional fuel-agnostic approach that treats all fuels used for building operations equally.

Proposed change 1835: drain-water heat recovery

This proposed change introduces new content related to how energy conservation points are awarded to drain-water heat-recovery units (DWHR). The NBC's energy performance path assigns energy conservation points for DWHR units, equipment that captures lost heat from hot water as it drains. However, these points are not provided in the prescriptive trade-off path. This change ensures energy conservation points are awarded in all relevant compliance paths. This proposed

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

change would improve the affordability of complying with the energy performance tiers through the prescriptive trade-off path because DWHR may be less costly than other energy conservation measures.

Support.

Proposed change 1824: scope and application of NBC Part 10

This proposed change introduces NBC Part 10 and states the scope and application of this proposed Part to the alteration of existing buildings

The scope of the initial version of Part 10 is limited to requirements applying to the alteration of existing buildings that improve the energy performance of the building. These include:

- NBC Part 10: Energy performance requirements applying to the alteration of Part 9 buildings. This Part must be clear in where to find the requirements applying to the alteration of the existing building in question.

- NECB Part 11: Energy performance requirements applying to the alteration of Part 3 buildings.

- Requirements for extensions will be included in Part 10. New construction that makes up the 'new' portion of the building must meet current requirements, where the existing portion of the extended space may require additional consideration.

This proposed change provides greater flexibility and cost controls as relaxations from impractical in the context of an existing building as it allows for the service life of equipment and materials to be extended.

Support.

Efficiency Canada
c/o Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6

Citations

[1] Government of Canada, A Healthy Environment and a Healthy Economy. 2021. Accessed March 28th, 2023

[2] Canadian Board for Harmonized Construction Codes, October 15, 2023. 2023_2 Proposed Changes to the NBC. NECB, NFC, NPC. Retrieved from: https://cbhcc-cchcc.ca/eng/public-review/2023_2/2023_2-proposed-changes-to-nbc-necb-nfc-npc-combined-file-2023-10-20.pdf

[3] BC Step Code, BC Step Code GHGI Report, Nov, 2019. Retrieve fromL http://energystepcode.ca/app/uploads/sites/257/2019/11/BC-Step-Code-GHGI-Report_Nov-2019.pdf