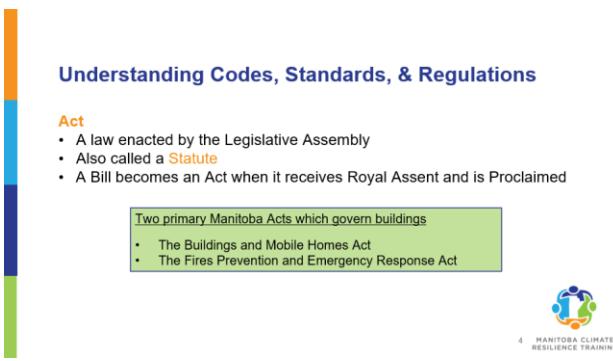


# An Introduction to Climate Change Through Codes, Standards & Regulations

## Understanding Codes, Standards and Regulations (CS&R)



The construction industry is both highly regulated and complex. Part of the complexity is due to overlapping jurisdictions and requirements. To work effectively in this environment, it is important to have a basic understanding of Canada's regulatory framework, and to be familiar with the core documents that govern this work. The sections that follow explain codes, acts, regulations, and standards – and how each of these relate and work together.



## How Acts and Regulations are Created

Before there can be a regulation, there must be a law. Laws start with bills in the legislature. When a bill is passed it receives Royal Assent by the Lieutenant Governor of Manitoba who approves the Bill on behalf of the Crown. After Royal Assent the Bill becomes law. The final step is to set the date it comes into effect or into force. When a starting date is set for the law to come into force, it is called Proclamation.

An Act is written to provide the broad powers in a topic area, like buildings, and the regulations provide the details. This is typically done because it takes less work to change a Regulation than it does to change an Act.

In Manitoba, there are two primary Acts which govern buildings – the Buildings and Mobile Homes Act, and the Fires Prevention and Emergency Response Act.

In the hierarchy of types of legislation, we typically have

# Acts, Regulations, Codes and Standards.

## Understanding Codes, Standards, & Regulations

### Regulation

- A delegated legislation
- Made by a person or body under the authority of an Act passed by the Legislature
- The regulation-making body is specified by the Act

### Regulations under The Buildings and Mobile Homes Act

- Building Fees Regulation
- Designated Buildings Regulation
- Manitoba Building Code
- Manitoba Plumbing Code
- Mobile Homes Standards and Permits Regulation



## Regulations

As mentioned earlier the details of an Act are covered in the Regulations.

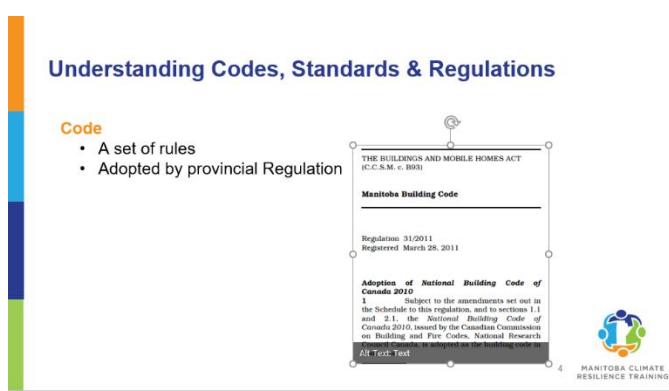
The three main regulations that currently govern buildings under the Buildings and Mobiles Homes Act are:

The Manitoba Building Code, Regulation 31/2011

The Manitoba Energy Code for Buildings, Regulation 213/2013 and

The Manitoba Plumbing Code Regulation 32/2011

Another Regulation for Buildings in Manitoba can be found in the Regulations under the Fires Prevention and Emergency Response Act, that is The Manitoba Fire Code Regulation 155/2011



## Codes

What is a Code? A Code can be defined very simply as “a set of rules”. Codes tell the user what they must do at a minimum.

A code is adopted by Provincial Regulation.

When we think of codes, we typically think of the Building Code or the Electrical Code, but there are also other codes, as an example, Boiler and Pressure Vessel Code. Some of these are written by Standards Organizations, which sometimes makes things a bit confusing, but they are Codes as well.

As an example, the Manitoba Building Code Regulation adopts the National Building Code (currently the 2010 edition) with some Manitoba-specific additions and revisions. The regulation is a short pdf document which must be used in conjunction with the NBC. This is the same process that must be used with other codes.

## Understanding Codes, Standards & Regulations

**Standards** - establish accepted practices, technical requirements and standard terms for diverse fields

**Technical standard** - an established norm or requirement regarding technical systems

Code – WHAT you MUST do   Standard – HOW you will do it



## Standards

In lay terms, a Code can be thought of what you **MUST** do, and a standard as **HOW** you go about doing it.

Standards establish:

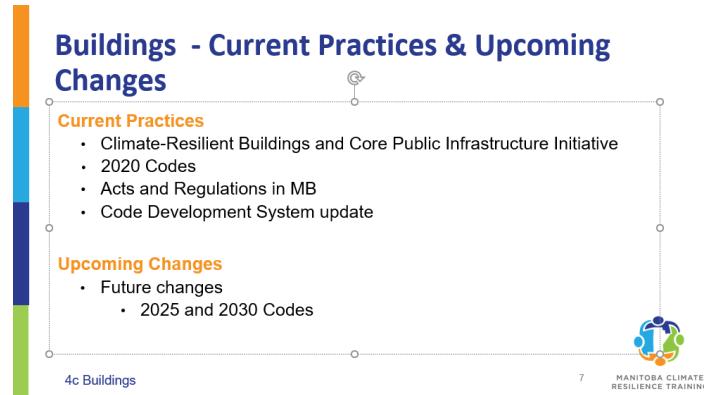
- accepted practices
- technical requirements
- standard definitions of terms for a wide spectrum of industries.

Standards may address any or all of the following:

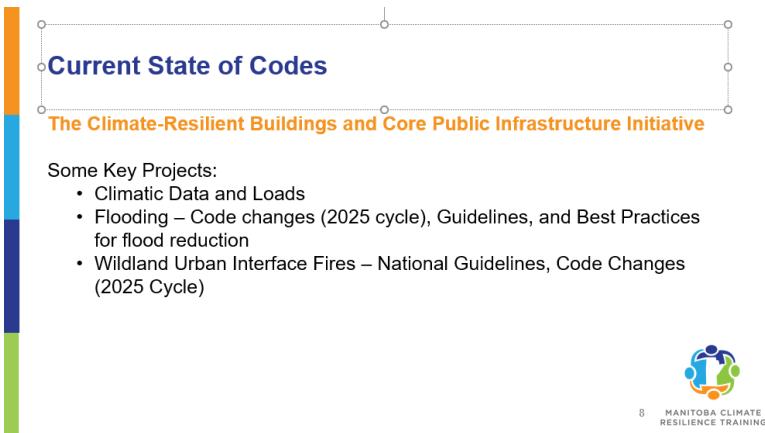
- the design of systems or equipment
- construction methods and techniques
- installation procedures – for materials, systems, or equipment – and,
- testing procedures

Standards can be mandatory, or they can be voluntary. They are distinct from Acts, Regulations and Codes and usually they are referenced within these pieces of legislation.

A standard can be referenced in whole or in part in a piece of legislation. When that occurs then the sections referenced are considered to be law or mandatory.



As an overview, I will be speaking to changes in the National Code Development system, general changes to the 2020 codes at a high level, the Acts and Regs in Manitoba as they apply to Climate change and mitigation, work at the National level that will inform code changes and finally about future changes to the Construction Codes themselves.



## Updating Standards for Climate Risks

Starting in 2016, the Climate-Resilient Buildings and Core Public Infrastructure Initiative undertook a number of projects to integrate climate resilience into building and infrastructure design guides, codes, and standards.

### Goals of the Climate Resilient Buildings and Core Public Infrastructure Initiative

- Ensure the safety and health of Canadians
- Reduce construction, operational and maintenance costs of buildings and core public infrastructure
- Protect and improve resiliency of new and existing infrastructure
- Prepare for the future, prolong service life of buildings and core public infrastructure

From a building perspective, the initiative wants to ensure that buildings are designed to be durable, prevent overheating and have roofs that are resilient to extreme weather conditions.

Some of the recent NRC research that has been

completed to support the Codes System is as follows:

**Climatic Data and Loads:** In this project they developed future-looking climate data, including temperature, precipitation and wind data, based on over 660 locations across Canada which will be used by technical committees when updating building and infrastructure codes and standards. Although the report has been published, the information is intended to be used in the 2025 edition of the codes.

**Flooding Resistant Buildings:** This project they developed standalone national guidelines with provisions for the design of buildings to address natural hazards, including flooding. Code change requests that are partially based on these guidelines will be submitted for consideration in future editions of the National Building Code of Canada (NBC). NBC 2020 did not address flooding.

**Wild Urban Interface Design:** Released a National guide for wildland-urban-interface (WUI) fires. The guide is intended to mitigate the growing risk of damage and loss due to wild urban interface fires by improving the resilience of buildings, infrastructure and communities to wildfires. The guide provides support for diminishing the risk in the wild urban interface areas of Canada, including information on: hazard and exposure assessment; vegetation management and construction measures; community planning and resources; and emergency planning and outreach.

## Future Further Research of the initiative:

- Overheating in Buildings
- Grey Water Usage
- 6 more projects on Durability and resilience in Buildings
- Increasingly stringent buildings codes to ensure that we are net zero ready by 2030.

The infographic features a vertical bar on the left composed of four colored segments: orange at the top, blue in the middle, dark blue at the bottom, and green at the very bottom. To the right of the bar, the title "Current Practices & Upcoming Changes" is displayed in a blue font. Below the title, the subtitle "2020 Codes" is shown in orange. A bulleted list follows, detailing the publication date and changes made. To the right of the list is a small graphic showing four code books: Building, Plumbing, Fire, and Energy. At the bottom left is the text "4c Buildings". On the right side, there is a logo for "MANITOBA CLIMATE RESILIENCE TRAINING" featuring three stylized human figures in a circle, with the number "9" positioned above the logo.

**Current Practices & Upcoming Changes**

**2020 Codes**

- Published in March 2022
- There are approximately 22 changes in Section 9.36 (NBC) and NECB and 20 in the NPC

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## Current Practices & Upcoming Changes (Buildings)

### 2020 Codes

- Codes were published in March 2022.
- Province has committed to adopt between Oct 2023 and March 2024.
- I have been advised there will be a 6 month window between adoption and enforcement.
- There are approximately 22 changes in Section 9.36 (NBC) and NECB and 20 in the NPC.



## Current Practices & Upcoming Changes

### 2020 Codes – NPC

- Introduces requirements for Rainwater Harvesting



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## 2020 Codes – NPC

- NPC introduces requirements for Rainwater Harvesting
  - There has been a growing interest in using available non-potable water supplies in the place of potable ones for selected purposes such as toilet flushing or irrigation.
  - Essentially so that fresh water is not being flushed down the toilet – literally.
  - Section 2.7.2 specifies requirements for roofing components, conveyance materials as well as treatment requirements for harvested rainwater before use.

## Current Practices & Upcoming Changes

### 2020 Codes - Part 9

- Whole building airtightness testing as an option
- Alignment with NRCan's ENERGuide Rating System
- Equipment performance for HVAC and SWH
- Introduced Tiered Energy Codes for housing

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## 2020 Codes Part 9

- Major changes in Section 9.36 are in Building Envelope and in energy consumption.
- Whole building airtightness testing is now an option for compliance.
- Some of the assumptions used in the NBC 2015 did not reflect the latest research in housing and were not aligned with NRCan's ENERGuide Rating System. The absence of such alignment resulted in loss of benefits from access to available tools, network of energy advisors and opportunities for simplifying the use of performance modeling. So that alignment has been completed.
- Equipment performance for HVAC and SWH were aligned with improvements in industry and the federal Energy Efficiency Act
- Introduced Tiered Energy Codes for housing
  - Tiered energy performance compliance is comprised of minimum base code requirements and pre-determined performance levels or tiers.
  - Tiers are defined in terms of the **percent improvement** as well as **energy consumption of**

## ***the building.***

- The first tier is the same as the minimum base code, representing the 2020 edition of the NBC.
- The energy consumption is then reduced by a percentage in successive tiers as shown on the slide.
- These percentages were selected to approximate the energy saving targets of market programs. You earn points for energy conservation measures for Tier 2 and up.
- Prescriptive requirements for Tiers 1 and 2 are currently available.
- Tiered energy performance compliance provides predictable future energy performance requirements which are to remain fixed in time.

### **Current Practices & Upcoming Changes**

#### **2020 Codes - NECB**

- Application statement
- Air leakage was revamped from 2017.
- Whole building air tightness testing as an option
- Thermal transmittance values of windows and doors decreased

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## **2020 Codes NECB**

- NECB always applied to new buildings only, and in the past there were no provisions requiring subsequent alterations to these buildings comply with the NECB. The NECB application statement was updated to cover subsequent alterations to and within buildings. An example of how this would apply would be - if a new building was built as a “shell” without interior finishes at

the time of occupancy permit, subsequent interior improvements would have to comply with the NECB.

- Entire Subsection update on Air leakage from 2017. These requirements are limited to air barrier assemblies and do not include testing procedures and performance levels for the air barrier system for the whole building. Unintended air leakage **does not** result from improper materials or assemblies, but rather from the interfaces of different building assemblies and components. Air leakage in buildings is responsible for 30 to 40% of energy use.
- The NECB 2020 introduces optional whole building testing in accordance with the ASTM E3158, “Standard Test Method for Measuring the Air Leakage Rate of a Large or Multi-zone Building”. The new provisions provide guidance for those who opt for whole building airtightness testing.
- To improve the overall building energy performance, the thermal transmittance values of fenestration, doors and opaque building assemblies are reduced. This reduces the excessive energy loss which can lead to smaller heating and cooling loads, smaller HVAC equipment capacities and reduced HVAC capital costs.

## Current Practices & Upcoming Changes

### 2020 Codes - NECB

- Thermal transmittance of Above Ground building assemblies were reduced

Assembly	Zone 7A				Zone 7B				Zone 8			
	2011	2015	2017	2020 (Tier 1)	2011	2015	2017	2020 (Tier 1)	2011	2015	2017	2020 (Tier 1)
Walls	R27	R27	R27	<b>R26</b>	R27	R27	R27	<b>R30</b>	R31	R31	R31	<b>R34</b>
Roofs	R31	R31	R41	<b>R47</b>	R35	R35	R41	<b>R49</b>	R40	R40	R47	<b>R52</b>
Floors	R31	R31	R35	<b>R41</b>	R35	R35	R35	<b>R47</b>	R40	R40	R40	<b>R49</b>

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As mentioned, the thermal transmittance of above ground building assemblies were reduced. So this slide shows the differences over Code editions. Note the value in RED is actually an increase in U value.

## Current Practices & Upcoming Changes

### 2020 Codes - NECB

- Table 3.2.2.3 Overall Thermal Transmittance of Fenestration

Assembly	Zone 7A				Zone 7B				Zone 8			
	2011	2015	2017	2020	2011	2015	2017	2020	2011	2015	2017	2020
Vertical Fenestration	2.2	2.2	1.9	<b>1.73</b>	2.2	2.2	1.9	<b>1.44</b>	1.6	1.6	1.4	<b>1.44</b>
Skylights	2.2	2.2	1.9	<b>2.41</b>	2.2	2.2	1.9	<b>2.01</b>	1.6	1.6	1.4	<b>2.01</b>

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To improve the overall building energy performance, the thermal transmittance values of fenestration and doors are reduced. Note in 2017 and earlier versions Table 3.2.2.3 referenced ALL FENESTRATION, now skylights are separated out.

The reduction in U-values of fenestration and doors reduces the excessive loss of energy leading to smaller heating and cooling loads of the building and results in smaller HVAC

equipment capacities and reduced HVAC capital costs. This capital cost savings will partially offset the incremental building envelope costs due to additional insulation.

The relaxation of the skylight U-values from vertical fenestration is to recognize that the physics of the heat transfer in a skylight is different than a vertical fenestration due to the slope of the skylight. Skylights are heated from below and the convection inside the glass unit increases due to the turbulence that is introduced. The proposed skylight U-values will result in a skylight with the same physical components (i.e. low-e coatings, gas fills, and warm edge spacers) as a window that complies with the lower U-values.

Current Practices & Upcoming Changes													
2020 Codes - NECB													
• Table 3.2.2.3 Overall Thermal Transmittance of Doors													
Assembly	Zone 7A				Zone 7B				Zone 8				
	2011	2015	2017	2020	2011	2015	2017	2020	2011	2015	2017	2020	
All Doors	2.2	2.2	1.9	1.9	2.2	2.2	1.9	1.9	1.6	1.6	1.4	1.44	

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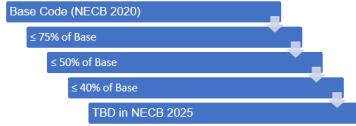
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In Zones 7 to 8 the values for doors were decreased to the same levels as fenestration. (Note U value a decrease is equivalent to an increase in R value).

## Current Practices & Upcoming Changes

### 2020 Codes - NECB

- Lighting power densities in Part 4 were updated
- Equipment performances for HVAC and SWH
- Introduced Tiered Energy Codes for buildings



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- The lighting power density (LPD) values listed in the NECB 2017 were based on older lighting technologies and were not representative of the more energy-efficient LED technologies and products that are now available. NECB 2020 updates interior lighting power density values to reflect this technology. It also provides better alignment of the LPD values with the rest of the North American market, reduces energy costs and the initial cost of luminaires. Harmonizing the NECB with ANSI/ASHRAE/IES Standard 90.1 also facilitates Code compliance enforcement in jurisdictions that reference both documents.
- Similar to 9.36 and for the same reasons, the Equipment performances for HVAC and SWH were updated
- Introduced Tiered Energy Codes for buildings
  - Tiered energy performance compliance is almost identical to that described in Section 9.36, comprised of minimum base code requirements and pre-determined performance levels or tiers.
  - Again, tiers are defined in terms of the **percent improvement** as well as **energy consumption of the building**.
  - The first tier is the same as the base code, representing the requirements in the 2020 edition

of the NECB.

- The energy consumption is then reduced by a percentage in successive tiers as shown on the slide. These percentages were selected to approximate the energy saving targets of market programs.
- Prescriptive requirements will be written for all 5 tiers, but currently only the base tier has prescriptive requirements.
- As an example, if the modeled building energy target of the reference building is 200 GJ (gigajoules) and the modeled annual energy consumption of the proposed building equals 150 GJ, then as a percent improvement  $200 - 150 = 50 \text{ GJ}$ , if you divide  $50/200$  that = 25%, so you have met the requirements for Energy performance tier 2.

## Current Practices & Upcoming Changes

### Province of MB

- No new Regulations for Climate Change, Resiliency or Mitigation
  - Building and Mobile Homes Act
  - Climate and Green Plan Act
  - Energy Act

4c Buildings



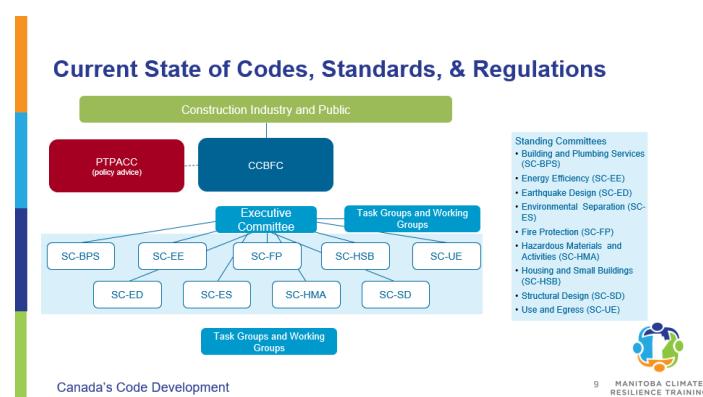
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## Province of MB Regulations

- MBC does not currently provide specific guidance on Climate Change, building resiliency or climate change mitigation.
- Although we are seeing the movement in newer codes.
- The current legislation we have in place in MB is:
  - Building and Mobile Homes Act
    - This covers construction and changes to buildings, but other than the adoption of NECB and Section 9.36, there is nothing specific to any of these items.
  - Climate and Green Plan Act
    - Has a requirement to develop a framework of policies, programs and measures to reduce greenhouse gas emissions and address the effects of climate change, promote sustainable development, improve management and protection of Manitoba's water resources and preserve and protect Manitoba's natural habitat and biodiversity.
    - The Made in Manitoba Climate and Green Plan, 2018-2022 GHG Reduction Goals, Efficient Trucking Program and the

Conservation and Climate Find information is reported on the Government of Manitoba's website ([gov.mb.ca/climateandgreenplan](http://gov.mb.ca/climateandgreenplan))

- Energy Act
  - The purpose of the Act is to facilitate orderly development of energy resources, ensure a reliable supply of energy to consumers at the least possible cost and to promote conservation and efficient use of energy.
  - Has one Regulation from 2009 regarding Energy Efficiency Standards for replacement forced air gas furnaces and small boilers.



## Canada's Code Development System - Old VS New

### Canadian Commission on Building and Fire Codes (CCBFC)

Until now, the overall authority for the codes rested with the **CCBFC**. The role of the CCBFC was to set broad policy and to adopt changes to the model codes.

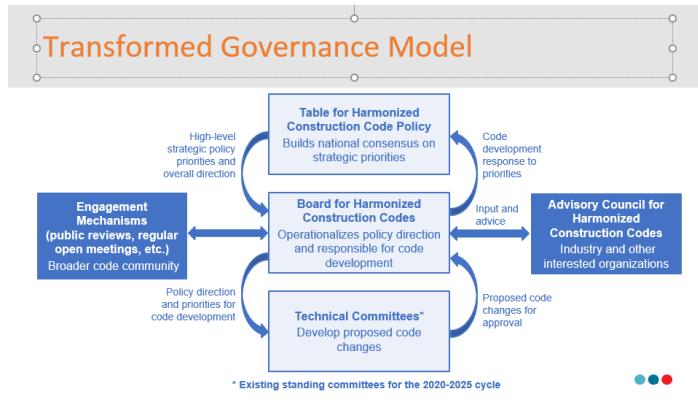
Policy advice was given to the CCBFC by an organization called the Provincial and Territorial Policy Advisory Committee on Codes. These representatives were selected by the Provinces and Territories.

The CCBFC developed Canada's National Model Construction Codes through a committee-based process and formally approved all Code documents and technical revisions prior to publication by NRC.

In November 2022 the CCBFC was replaced by the Canadian Board for Harmonized Construction Codes (CBHCC). Generally, the former members of PTPACC sit on the Board.

## **Standing Committees**

The standing committee that are noted here, are still in place. They will continue their work until the next code cycle at which point, they will transition to Technical Committees.



## Transformed Governance Model

Last fall, the Canadian code system began its transition to the new Codes Development System. As shown in the Slide, this new system has an additional layer. The Canadian Table for Harmonized Codes is comprised of Deputy Ministers from across Canada and a representative from NRC. This group oversees the Canadian Board on Harmonized Construction Codes and sets the overall strategic direction for Codes in Canada.

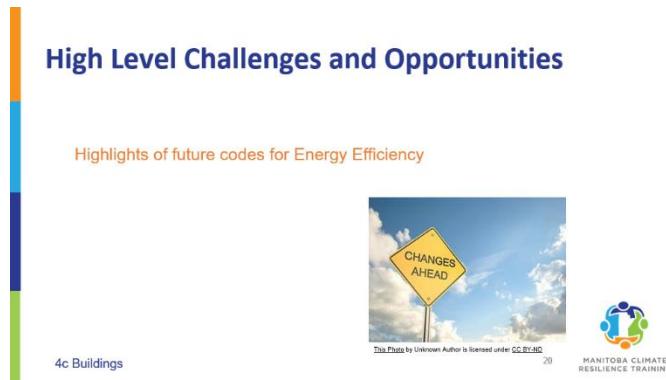
The Board has taken over the role of the decision-making body from the CCBFC and it is comprised of former PTPACC members and a staff person from NRC. Both the Canadian Table and the Board are supported by Codes Canada Staff.

The Board will operate as a consensus-based board, similar to the CCBFC. It will hold public and private meetings quarterly each year.

Another addition to the new system is the creation of a Stakeholder Advisory Council. This group will be comprised of appx 45 National level associations that

represent the stakeholders involved in building construction in Canada. Note only groups with a national representation can participate on the Advisory Council.

For one year, members of the former Executive Committee of the CCBFC will participate on a Transition Advisory Committee to the new Board to provide assistance and advice on issues as they come up.



## Highlights for Future Codes

In 2025 NRC is planning on introducing a new GHG Objective. It will cover Operational Carbon. This means operational fuel consumed and carbon intensity of fuel used to operate a building including both direct and indirect emissions.

In 2030 the plan is to introduce a new GHG Objective for Embodied Carbon (or life cycle carbon). This Objective will look at GHGs related to manufacturing building components, transportation and construction emissions over the life cycle of the building.

Recognizing that this is going to be a large task for design

professionals and Building Inspectors to undertake as a part of a design and permit process, there are plans to use BIM software to assist with the process.