RE: Feedback to the Ministry of Municipal Affairs (MMA) from the Clean Air Council on EBR Registry Number: 013-0536: 2017 Next Edition Building Code Consultation

The Clean Air Council would like to commend the Province for undertaking a consultation on opportunities to reduce greenhouse gas emissions in the building sector through proposed changes to the Ontario Building Code (OBC) in order to support the implementation of the Province of Ontario's Climate Change Action Plan (CCAP). The Clean Air Council (CAC) is a network of 28 municipalities and health units from across the Greater Toronto, Hamilton and Southwestern Ontario Area[1] who collaboratively work on the development and implementation of clean air and climate change mitigation and adaptation actions. The CAC is proud to have the Province of Ontario as a CAC member.

Below is a summary of the feedback and recommendations from Clean Air Council member representatives[2].

There is the need for the Province and Municipalities to work together to advance the uptake of energy and water efficiency and climate change standards within the Ontario Building Code.

- **The Clean Air Council recommends that the Ontario Building Code (OBC) create a long-term pathway to net-zero emissions for both Part 3 and Part 9 Buildings similar to the BC Energy Step Code. A similar type of step code for Ontario could be planned to start in 2022.The benefits of doing so are that the industry can then plan and develop training programs based on a consistent framework and manufacturers can better plan for market needs and accelerate the development of products that will drive performance and meet the required targets.**

It should be recognized that in order for Ontario to achieve its greenhouse gas reduction targets all buildings built below the net zero standard will likely need to be renovated for energy

[1] CAC Municipal and Public Health Unit members include: Ajax, Aurora, Brampton, Burlington, Caledon, Clarington, Durham Region, Guelph, Halton Region, Halton Hills, Hamilton, King, London, Markham, Mississauga, Newmarket, Oakville, Oshawa, Peel Region, Pickering, Richmond Hill, Simcoe-Muskoka District Health Unit, Toronto, Vaughan, Region of Waterloo, Whitby, Windsor, York Region.

[2] Municipal staff representatives on the Clean Air Council (CAC) were consulted in the preparation of this submission to reflect the priorities and directions of the member municipalities, but direct endorsement of this document by Municipal Councils was not sought due to the limited time frame of consultations. Many municipalities are also preparing their own independent submissions. CAC representatives are the municipal change agents within leading climate change action municipalities and have been working collaboratively across the region for the last 15 years to support and enable progress on clean air and climate change actions. The consultations were facilitated by the Clean Air Partnership, a charitable environmental organization that serves as the secretariat for the Clean Air Council.

efficiency improvements within a decade's time. These energy improvements will require a higher financial cost and will larger effort to achieve the energy efficiency and resilience targets had they been built to that standard at the time of construction. However, it is also recognized that there is the need for the market to prepare to deliver on the above 2030 net zero carbon emission goal. The goal should therefore be to accelerate the market as quickly as possible to achieve the net zero carbon emissions outcome, while ensuring market capacity and quality control.

- **Therefore, the Clean Air Council recommends that the Province in addition to enabling municipalities to pass by-laws related to green and other cool roof surfaces; (see page 7 of this submission) also provide municipalities with the authority to pass by-laws that enable them to accelerate adoption of higher than mandated energy and/or GHG performance within the Ontario Building Code into new buildings for developments that occur within their jurisdiction. Enabling Ontario municipalities that have the desire and capacity to move ahead of the minimum OBC standards to do so will benefit the entire province by building industry capacity for energy efficiency and climate change resilience innovation and thereby test and advance the market at a smaller scale. Successful adoption of standards at the municipal scale can then inform and be integrated into future updates to mandatory components of the Ontario's Building Code thereby increasing capacity of the wider market more quickly and effectively across Ontario.**

- **While the proposed building code energy improvements are prescriptive the Clean Air Council recommends that the MMA consider transitioning to expressing energy efficiency targets as energy intensity or greenhouse gas intensity (i.e.g. EUI or GHGI) targets. This would improve consistency in achieving the desired energy targets, provide greater flexibility and opportunity for innovation as well as better enable improved performance monitoring and benchmarking post occupation. In combination with Ontario's Energy and Water Reporting and Benchmarking regulation, this will allow ongoing monitoring as well as consistency, flexibility and innovation in achieving the desired outcome. It is recognized that the data collection at present may be a challenge but over time the use of how new buildings perform compared to code requirements, which will in turn enable any major performance gaps to be addressed in future code updates or through other mechanisms (e.g. training).**

- **The Clean Air Council would also like to highlight the need for more performance evaluation efforts to be undertaken in order to validate energy efficiency estimates being promoted by manufacturers and/or being used by energy models. There is a gap at present in studies that "reality test" energy reduction estimates. The Municipality of Clarington's Priority Green Project included performance monitoring of 6 demonstration homes over a one year period under owner occupied real-life conditions and is an example of the types of projects that need to be advanced. The results of such projects need to use an open and transparent methodology and be shared widely. Factors that should be considered include, but are not limited to:**

performance measurement evaluation; increasing carbon costs associated with natural gas; best estimates on energy price changes over time; price differential between installation of measure at time of building versus later retrofit.

- **While not specifically a building code item, the Clean Air Council supports the development of better guidance on energy modelling that could reside in the appendices of the OBC. This would be over and above what is outlined in Section 8 of the NECB and extend to "who" is allowed to of provide an energy model as proof of compliance (qualifications, experience etc.) and what represents "good engineering practice" with regards to energy modelling. We also support the development of better compliance tools such as province wide checklists or online portals that would aid in data collection and assist local governments in managing compliance related to energy efficiency requirements.**

Proposed Changes for Energy Efficiency Requirements for Houses (p. 13 – 15 of Overview document)

2019: Near-Term Energy Efficiency Requirements for Houses: An additional change with respect to energy in houses and small buildings is proposed to come into force on the date that the next edition of the Building Code takes effect, which is proposed to be January 1, 2019. This change would remove reference to an option for meeting energy efficiency performance requirements to help reduce GHGs. The primary intent is to remove the option to allow for design based on the National Research Council's EnerGuide 80 rating, as this standard has been replaced.

2020: Near-Term Energy Efficiency Requirements for Houses

- Continuous insulation: To increase the energy efficiency of a new house's building envelope, the Ministry of Municipal Affairs is proposing to require the use of continuous insulation in all wall assemblies.
- Triple-pane windows and sliding doors: The Ministry of Municipal Affairs is proposing to require that all new houses be constructed using triple-pane windows and sliding doors.
- Air leakage testing: The government is proposing a two-phase approach to air-tightness testing. In phase one – which would come into effect in 2020 – air-tightness testing and providing results will become mandatory. The intent of this proposed requirement is to help develop the building sector's capacity to test and construct energy efficient houses. In phase two, beginning in 2022, achieving a specific air-tightness performance level will be required.
- Further limitations to building envelope trade-offs: The Ministry of Municipal Affairs is proposing to reduce the trade-offs option in the performance paths of SB-12 between building envelope and mechanical systems from 25 per cent to 10 per cent to help reduce energy consumption and GHG emissions from new houses.

2022: Longer-Term Energy Efficiency Requirements for Houses Proposed Changes:

- Twenty per cent decrease in energy consumed by houses: With the energy performance requirements contained in the 2012 version of the Building Code (that came into effect in 2017), a house built today consumes 50 per cent less energy than a house built in 2005. Under the proposed 2022 requirement, a new house would use approximately 60 per cent less of the energy of its 2005 equivalent. This energy consumption reduction would be achieved through the proposed Building Code changes outlined below.
- Air-tightness requirement: In 2022, the Ministry of Municipal Affairs is proposing to mandate that all new houses meet an air-tightness requirement of 2.0 air changes per hour (for detached houses) or 2.5 air changes per hour (for attached houses). Consistent with previous editions of SB-12, houses that exceed these requirements would receive credits. This means builders that exceed these minimum air-tightness requirements would be able to use less stringent requirements for other specified building components and assemblies.
- Improved wall insulation: Building on the proposed improvements for 2020, further requirements for 2022 generally include higher insulation values throughout the house and specifically, a requirement for continuous insulation for all above- and below-grade walls and exposed floors. The proposed requirements would also include insulation under basement slabs in contact with the ground as well as perimeter insulation for exposed slab edges.
- More energy efficient triple-pane windows and sliding doors: Adding to the previous round of proposed 2020 improvements, proposed requirements for 2022 include more energy efficient triple-pane windows and sliding doors with a U-value at or below 1.2.
- Eliminating building envelope trade-offs: beginning in 2022, builders can only substitute building envelope components for other building envelope components.
- Enhanced mechanical equipment efficiency: Currently, the Building Code mandates a range of minimum energy efficiency standards to cover different fuel fired equipment and fuel types. Proposed 2022 requirements would raise the minimum allowable energy efficiency levels for all equipment used in conjunction with prescriptive compliance paths.

Recommendation: Clean Air Council members are supportive of the above proposed changes to the Ontario Building Code. As was previously mentioned the Clean Air Council recommends that municipalities have the authority to require an accelerated timeline for the inclusion of the above measures into new buildings in order to test and advance the market at a community hub or municipal scale. Successful adoption of standards at the municipal scale can then inform the inclusion of these mandatory components into Ontario's Building Code thereby increasing capacity of the wider market more quickly and effectively across Ontario.

Background on Energy Efficiency in Large Buildings

2019: Near-Term Energy Requirements for Large Buildings

When the energy performance requirements of the 2012 version of the Building Code came into effect in 2017, a large building now consumes 35 per cent less energy than its 2005 equivalent. Under these proposed requirements, intended to take effect in 2022, a new large building would consume 48 per cent less energy than its 2005 equivalent.

Proposed in-effect date: 2022: Large buildings are already required under the Building Code to meet specific requirements for peak load and GHG emissions. Proposed requirements for 2022 would continue to reduce peak electric demand.

- Further energy efficiency improvements that would result in an overall 20 per cent decrease in energy consumed by large buildings.
- Mandatory air-tightness testing without a specified target: Similar to the approach for houses in 2020, it is proposed that all large buildings constructed in 2022 would be required to undergo air leakage testing but would not have to meet a specific air-tightness target. Credits would be provided for buildings that exceed a specified air-tightness criterion.
- Further limitations to building envelope trade-offs: A trade-off limitation would also be introduced to protect the thermal performance of the building envelope
- Requiring heat or energy recovery unit in apartment buildings: As buildings become increasingly air-tight due to improvements in the thermal performance of the envelope, it becomes increasingly important to ensure that indoor air quality does not deteriorate. As is also required in other large buildings, MMA is proposing that all apartment building ventilation systems be required to have a heat or energy recovery unit (HRV).

Recommendation: Clean Air Council members are supportive of the above proposed changes to the Ontario Building Code. As was previously mentioned the Clean Air Council recommends that municipalities have the authority to require an accelerated timeline for the inclusion of the above measures into new large buildings in order to accelerate the market transformation and test and advance the market at a community hub or municipal scale. Successful adoption of standards at the municipal scale can then inform the inclusion of these mandatory components into Ontario's Building Code thereby increasing capacity of the wider market more quickly and effectively across Ontario.

Energy Efficient Renovations in Houses and Large Buildings

Proposed in-effect date: January 1, 2019: Requirements to improve the energy efficiency of buildings undergoing renovations.

Currently, when a building undergoes renovation, the Building Code does not require upgrades to energy efficiency levels. In contrast, the Building Code generally requires upgrades during renovations to the fire and structural safety, accessibility and health components of the part of a building being renovated. The proposed requirements would apply to both houses and large buildings undergoing renovations, and take into account the practical difficulties that can be

encountered in existing buildings and provide opportunity for energy efficiency improvements. For example, renovation work that involves materially altering or repairing the building envelope, such as roofs, floors and walls that are exposed, may require additional insulation, where practical, and may require installation of an air and vapour barrier if these are not present. Proposed requirements would also provide improved standards for renovation projects that replace windows, skylights, and sliding doors. Lastly, when a renovation involves replacing space heating or cooling equipment, the proposed renovation changes would in some cases require improvement over existing conditions, and in others, improvement to meet current minimum energy efficiency standards.

Clean Air Council Feedback

Advancing the energy efficiency of Ontario's existing building stock is imperative to enabling Ontario to achieve its energy conservation and greenhouse gas reduction goals. In addition, increasing the energy efficiency of Ontario's building stock will also result in the following co-benefits:

- Reducing Ontarians vulnerability to energy price increases over time;
- Retaining more energy dollars within the community;
- Building the energy efficiency market and increasing high quality local jobs associated with serving that market;
- Air pollution and public health improvements as a result of reduced fossil fuel use and reduced vulnerability to extreme heat; and
- Reductions in community vulnerability to energy disruptions and extreme weather events.

It has been found from energy efficiency programs that the greatest opportunity to increase the uptake of deep energy retrofits is when home and building owners are planning on undertaking general building renovations.

Recommendation: The Clean Air Council strongly supports applying energy efficient requirements to significant renovation projects.

- We support that these changes apply to all buildings.
- These new requirements for existing buildings should be accompanied by energy efficiency programs and financing that would enable these measures to be undertaken without creating significant financial pressure and negatively impacting on affordability.
- These new requirements should be accompanied by training for municipal staff involved in code enforcement and the industry stakeholders who will be responsible for compliance during renovations.
- In addition, requiring the adoption of energy efficiency improvements/measures upon the undertaking of significant renovations may provide a lever to address energy poverty and the challenge of the split incentive problem (where tenants can't make upgrades to reduce their energy use but landlords have no incentive to invest in energy efficiency as they do not face the financial costs of energy use).

- It is also recommended that policies such as energy ratings and disclosure be advanced in order to increase energy literacy and awareness of energy needs of buildings. This is a key policy that is required in order to drive the market for retrofits and to address the split incentive challenge (where tenants can't make upgrades to reduce their energy use but landlords have no incentive to invest in energy efficiency as they do not face the financial costs of energy use).
- Requiring energy efficiency improvements upon the undertaking of significant renovations should also be accompanied by measures for multi-unit residential buildings (MURBs) that can reduce resident's vulnerability to extreme heat inside the buildings and thereby help prevent a predicted increase in premature deaths due to extreme heat, as well as to help to minimize the predicted increase in energy consumption due to air conditioning. Examples of measures include external shades on windows, increased insulation, ceiling fans, and passive ventilation. See page 9 of this submission for more information on this topic.

Electric Vehicle Charging in New Multi-Unit Residential Buildings

Proposed in-effect date: January 1, 2019

The Building Code currently allows electric vehicle charging infrastructure in new buildings, but does not require it in multi-unit residential buildings.

- EV charging in new multi-unit residential buildings: proposed technical changes to the Building Code that would require EV charging in 20 per cent of parking spaces and "rough-ins" in the remaining spaces in new multi-unit residential buildings where parking is provided within the building.

Recommendation: The Clean Air Council supports a gradual increase of the percentage of EV charging stalls and recommends that charging be expanded to 33% of stalls in all new homes, townhomes with garages and at a minimum a percentage of multi-familyunit residential parking spots.

At a minimum, the electrical rough ins should be required for all garages and parking spaces as the costs associated with installing electrical vehicle charging systems will be lowest when it is installed at the construction stage for new buildings in 2022. Studies have shown that providing this level of charging would enable future accommodation of load-managed solutions that can expand service to 100% of stalls without requiring a significant cost.

In addition, it is highly recommended that wording in the OBC be changed from "allows" electric charging vehicle infrastructure to "shall" require electric vehicle charging infrastructure in order to ensure implementation.

Green Building Standards and Green Roofs: Other Green Technologies: Proposed in-effect date: January 1, 2019

Recent changes to the Municipal Act, City of Toronto Act and Building Code Act allow municipalities to pass by-laws regarding green standards related to the building in certain circumstances. Such bylaws could be passed only where there are technical standards in the Building Code and those standards are specifically identified for this purpose in the Building Code. Below are areas that are referenced in the OBC consultation document for municipal by-laws addressing the building scale.

Green Building Standards

- **The Clean Air Council strongly supports the ability for municipalities to pass by-laws, however, requirements of such by-laws should extend to building standards that can help reduce energy consumption and greenhouse gas emissions, water conservation and construction waste.**
- **As has already been noted it is strongly recommended that municipalities be enabled to pass by-laws adopting proposed energy efficiency requirements in SB10B and SB12B earlier than 2022 (current date which these would come into effect).**

Municipal green development standards tend to cover a wide range of metrics supported by the Planning Act and the OBC. Green development standards may also be supported by provisions in the MOECC Stormwater Management Design Manual, Growth Plan, Greenbelt Plan, Source Water Protection Act, etc.

Planners tend to view the Planning Act as addressing the exterior design elements (e.g. Bill 51 amendments to the Planning Act) while the OBC addresses the interior of the building. The ability of municipalities to pass by-laws should extend to the range of OBC matters that can reduce GHG emissions, in additional to green roofs, such as: higher than mandated OBC standards for energy efficiency; mandating net zero ready installations; and mandating on-site renewable energy generation or connection to a community energy system in certain locations (e.g. high density designations or unless a green roof is installed).

The creation of a by-law is a closely scrutinized municipal process, which will ensure appropriate consultation and analysis is undertaken by a municipality in its formulation and approval. Furthermore, any effort to create a by-law will require that the staff resources, other anticipated costs and risks/liability be addressed by the municipality. For this reason, it is not a risk to the Province, but rather to the municipality contemplating a by-law. Municipalities that determine that such a process and policy makes sense for their jurisdiction should have the ability to enact such by-laws.

Green Roofs

The Clean Air Council strongly supports the OBC proposed changes that would enable municipalities to enact green roof by-laws however it is not understood nor recommended that the proposed SB-14 only applies to systems up to 150mm and only Part 3 buildings. The stated justification of the proposed amendment is to "…. help building officials to better understand

the scope of what they should be looking if an application for a vegetative or reflective roof is submitted." However, if an Ontario municipality adopts a by-law under the Green Standards provisions (of the Municipal Act) requiring green roofs, this standard will only apply to a small population of potential green and reflective roofs.

There is no clear rationale why all Ontario municipalities should not have a robust standard for green roof design. If adopted as drafted, the proposed standard will create multiple standards in Ontario; with the provincial standard falling short of the City of Toronto Standard.

- **It is recommended that the proposed green and reflective roof standard be able to be applied to all buildings except low rise residential that is less than 4 storeys and less than 5 dwelling units.**

A green roof is a system. If there are limited provisions in the standard which increase the ability of the vegetative component to survive, the risk of failure increases. Toronto's Green Roof Construction Standard includes requirements for maintenance plans, leakage testing, planting and growing media and additional measures to help improve the vegetation's survivability. These significant elements are missing from the proposed OBC standard, which as a result would create a provincial standard that is at greater risk of failure.

- **It is recommended that the OBC include maintenance plans, leakage testing, planting and growing media and additional measures to help improve the vegetation's survivability in its update. Recognizing that designers, builders and the public need additional supporting materials on green roofs, it is also recommended that the Ministry of Municipal Affairs partner with the City of Toronto to produce a Supplementary Guidelines document for green roofs, similar to the City of Toronto's "Green Roof Supplementary Guidelines."**

Supporting Adaptation to Climate Change: Proposed in-effect date: January 1, 2019

• Hurricane straps

• Backwater valves in houses

Currently, the Building Code does not require hurricane straps for new houses.
To help buildings to be more resilient during severe weather events characteristic of climate change, the Ministry of Municipal Affairs proposes to require hurricane straps in all new houses.

Based on feedback received during consultation, the government is currently considering requiring backwater valves in all new houses to help protect buildings against sewer backflow during severe rainfall events. These requirements would apply only in areas connected to municipal sewer systems, not to houses on their own on-site wastewater systems. This initiative would complement other proposed adaptation requirements.

The Clean Air Council strongly supports the inclusion of all the above measures into the next Ontario Building Code update. These measures as well as other resilience measures provide a strong return on investment and play a significant role in strengthening the ability of Ontario buildings to being more resilient to extreme weather events and will also reduce governmental, insurance and individual costs as weather events become more extreme as a result of climate change. Clean Air Council member jurisdictions look forward to working with the Province and the Ministry of Municipal Affairs to further refine the below measures into standards that can be integrated into the next Ontario Building Code update.

- **In addition to the above measures the Clean Air Council would also like to recommend the following:**
- **That the climatic data in the Building Code be updated to reflect current and expected future weather conditions.**
- **That the MMA work with Durham Region's Resilient House Project Team to undertake a review of potential technical specifications and resilience measures that can be integrated onto the OBC update to increase resilience to extreme weather events.**

In addition to measures that reduce physical damage to buildings as a result of extreme weather there are also additional measures related to protecting public health that the Clean Air Council would like to recommend that the Province integrate into the next update to the Ontario Building Code including introducing OBC changes for multi-unit residential buildings that manage future increases in extreme heat by preventing the resulting increase in premature deaths due to extreme heat and minimizing the resulting increase in energy consumption due to air conditioning. Examples include:

- OBC requirements that increase energy efficiency and reduce the need for air conditioning. Examples of potential OBC requirement and other approaches the Province could pursue to meet multiple goals include:

    - External shades on windows;
    - Increased insulation
    - Ceiling fans
    - Effective, passive ventilation
    - Windows that open wide high up to allow ventilation while preventing falls
    - High albedo (cool, reflective) surfaces for the roof, envelope and surrounding site such as parking lots
    - Shared cool rooms inside apartment buildings, to provide air conditioning to protect the health of the most vulnerable people who require active cooling
    - Shared cool spaces outside apartment buildings, to provide shaded, treed spaces with seating as a refuge from overheated apartments

- Measures and standards that enable and encourage building managers to utilize the options in the OBC that prevent falls from windows but still allow for ventilation. Measures related to this are found in the current OBC (Section 3.3.4.8 Protection of Openable Windows) and in the Residential Tenancies Act (Section 25 Window Safety

Devices). A program could be modelled on that of New York City, which includes an approved list of window guard manufacturers and products. Information on New York City's program is available at: https://www1.nyc.gov/site/doh/health/health-topics/window-guards-faq.page.

- In addition, to help buildings and their occupants withstand extreme weather, the Clean Air Council supports the inclusion of "Minimum Backup Power Guideline for multi-unit residential buildings (MURBs) developed by the City of Toronto which presents a number of opportunities to help improve resilience to area-wide power outages in MURBs, both existing and new.

Section 4	**Commissioning of Large Buildings**
	1. What parts of the building should be subject to building commissioning to support the government's energy conservation and GHG emissions goals? Note that the below provisions are referenced against the Seattle Energy Code which has the most rigorous commissioning framework. All Part 3 buildings should be subject to the commissioning requirement provided their systems meet the following minimum requirements. These systems include: • HVAC and refrigeration: All HVAC systems with over 70 kW (240 kBTU/h) cooling or heating, plus all walk-in coolers and freezers and all refrigerated warehouse coolers and freezers. • Lighting and receptacle controls: Lighting and controlled receptacles in projects with at least 20 kW installed lighting overall, or more than 10 kW installed lighting with daylight or occupancy controls. • Water heating: any system with more than 70 kW capacity. • Metering: All metering and sub-metering systems **2. Should building commissioning apply to all large buildings or a select group of large buildings based on either occupancy type or size (e.g. assembly occupancies that are a minimum 4,645 m2 (50,000 sq/ft) in size)?** Commissioning requirements should apply to all large buildings and should be based on system size rather than floor area or occupancy. **3. How regularly should a building commissioning process be reviewed by municipal enforcement officials, and what information should be made available to them?** Recommend that submittals be reviewed at building permit application stage and during occupancy. A Commissioning Plan should contain the following:

- Narrative description of your commissioning proposal.
- Commissioning team roles and responsibilities, and contact information.
- Schedule of commissioning activities, listing what systems will be commissioned, functions to be tested, the required test conditions, and performance criteria.

At Occupancy Permit a Commissioning Report containing the following should be generated (and signed by both the accredited commissioning agent and building owner):

- Test results
- Deficiencies noted and corrections made
- Test procedures and criteria
- List of deferred tests, and climatic conditions required to perform them
- List of unresolved deficiencies

4. Beyond any building commissioning process, what remedial actions can building owners/operators be reasonably required to take to ensure that buildings continue to operate as originally designed?

We recommend that testing is done on all systems and that these tests as well as any deficiencies are summarized in a report signed by the owner. Compelling action after occupancy is problematic without abatement requirements.

Some cities, like Seattle, have created a Commissioning Permit that projects apply for prior to occupancy being granted. The Commissioning permit must be closed within 12 months of it being issued. This type of policy tool allows commissioning requirements to transcend the occupancy permit and extend into the first 12 months of operation in order to allow for testing to occur throughout all four seasons.

5. How can proposed regulations for home energy audits, and large building energy reporting and benchmarking, complement potential future requirements for building commissioning?

Reporting and benchmarking programs enable the implementation of Building Energy Performance Standards (BEPS). These are abatement requirements that stipulate achieving certain performance standards. These standards could be a Portfolio Manager score or EUI outcome for certain classes of commercial buildings. The benefit of these

	programs is that they can target the worst performers where the largest savings can potentially be realized at the most optimal cost.
Section 4	**Adaptive Thermostats**
	1. Does the building industry currently incorporate adaptive thermostat technologies? Often used in low-rise residential, new high rise construction also have thermostats (although not all adaptive). **2. How much do adaptive thermostats reduce GHG emissions?** There have been preliminary explorations but no public third party studies for the Ontario market. Conservative estimations are around 2%-5%. **3. Are there alternative technologies that achieve similar energy reductions being used by the industry?** The switch to electric HVAC equipment (rather than natural gas) would have a much larger impact on GHG reductions than adaptive thermostats. **4. Should the Building Code require adaptive thermostats in all new houses and multi-unit residential buildings?** This is a good technology that can result in energy and GHG reductions as well as other benefits (providing users with control over their interior environment, having the ability to use set back schedules during no occupancy). The use of this technology is also relatively wide spread across certain building types. It also has the potential to enable future participation in next generation automated demand response type programs. Recommend including as voluntary in 2020 and mandatory for 2022.
Section 4	**Sub-Metering**

	1. Can the Building Code better enable sub-metering for electricity? If so, what amendments could be made to enable sub-metering? The purpose of sub-metering is two-fold. First, to ensure that consumers have the requisite price signals to make energy conservation choices, and second, to enable building owners to undertake retro-commissioning or other corrective actions to reduce energy use. Electrical systems should be sub-metered in the following way: • By major occupancy (e.g. retail units should be sub-metered separately from commercial office space) • By use (e.g. parking, amenity and common spaces should all be sub-metered separately within multifamily buildings) • Where a building component is expected to consume more than 5% of the buildings total energy (e.g. central HVAC system) • In commercial buildings for every floor of the building This level of sub-metering allows owners to diagnose issues quickly and effectively compared to grouping all loads on a single meter. **2. Should the Building Code simply require the "rough-in" of electrical systems to facilitate sub-metering installation by responsible utilities or authorities? If so, are there products available that would assist in future sub-metering?** There are many sub-metering technologies that can be retro-fitted into buildings. **3. Should the Building Code's requirements for sub-metering be expanded to better enable sub-metering for water and gas supply?** Yes. The minimum sub-metering requirements should be at the building level so that multiple buildings are not connected to a single meter. Regulations should also stipulate that separate uses (e.g. Commercial, Retail, Amenity

	space) within a building should be metered for gas and water separately. MMA should work with Technical Standards & Safety Authority to review the technical specifications and opportunities.	
Code Change	**Proposed Change**	**Comments**
2-CC-A-01-04-01	The proposed change would establish a list specifying the circumstances under which municipalities could pass by-laws requiring green standards and would make municipal green standards by-laws applicable law for the purpose of issuing a building permit.	Support ability for municipalities to pass by-laws, however, requirements should be expanded beyond green and reflective roofs to include other building standards that can help reduce energy consumption and greenhouse gas emissions, water conservation and construction waste. Consider adding specific commentary on district energy regulation including mandatory connection requirement in district energy zones. Currently not addressed in the code. Consider allowing municipalities to pass by-laws adopting proposed energy efficiency requirements in SB10B and SB12B earlier than 2022 (current date which these would come into effect).
2-CC-A-03-02-01	The proposed change introduces two new building envelope-specific functional statements.	Support enabling of thermal bridging and air leakage functional statements.
2-CC-B-03-01-01	The proposed change would require electric vehicle charging equipment in all Part 3 and Part 9 multi-unit apartment buildings where parking is provided in the building.	Strongly support recommendations that enable the deployment of electrical vehicles in new multi-unit residential buildings. Recommend that provisions gradually increase the % of EV charging stations in 2022 and future code updates.

2-CC-B-04-01-01	The proposed change would add loading requirements to provide for solar-ready roofs for large buildings, reducing the probability of future expensive structural retrofits, and thereby potentially making solar energy systems more cost-effective.	Support adding structural provisions during construction to make it easier to add PV/solar DHW systems later on. Recommend adding solar ready requirement to Part 9 residential as well as including provisions for a chase connecting the attic to the mechanical room.
2-CC-B-07-06-01	The proposed change addresses flow rates and valves for more efficient water supply fittings.	Recommend aligning water efficiency requirements with California. Recommend equipping water closets with devices capable of preventing flush cycles when not in use (for occupancies other than Group C). Recommend reducing water closet consumption to 3 LPF, down from 6 LPF (for occupancies other than Group C).
2-CC-B-09-32-01	The proposed change harmonizes the Building Code with Supplementary Standard SB-12, which requires that mechanical ventilation systems include a heat or energy recovery ventilator.	
2-CC-B-09-32-02	The proposed change harmonizes the building code with SB-12 and requires that the principal exhaust shall be provided through a heat or energy recovery ventilator.	
2-CC-B-09-32-03	The proposed change will allow the use of energy recovery ventilators where a heat recovery ventilator is required or used.	There has been some hesitation on connecting bathroom exhaust through an ERV due to potential increase of indoor moisture levels over time. These code updates need to clarify

		whether ERV should be connected to building exhaust only or to bathrooms & other fans like a range hood. Section 9.32.3.11(2) provides minimum sensible recovery efficiency for an HRV. Clarify whether this efficiency also applies to an ERV, or if a different efficiency needs to be met. Minimum SRE specified is 55% for -25C, recommend increasing this number.
2-CC-B-09-32-04	The proposed change harmonizes the building code with SB-12 and requires that ventilation systems coupled with forced air heating systems include a heat or energy recovery ventilator.	Recommend addition of direct ducting requirement to bedrooms.
2-CC-B-11-03-01	The proposed change introduces new requirements for energy efficiency upgrades during renovation of houses and all other buildings.	Strongly support proposed changes to include energy efficiency during building renovations (similar to fire and structural safety). Recommendation that commissioning of commercial buildings could be used as a performance outcome. Can also consider referencing parts of SB10B and SB12B instead of spelling out all of the details. Also recommend a pathway for increasing targets in the future, given that existing buildings will need to be retrofitted in order to reach our GHG emission targets. For example, thermal performance values in Tables 11.6.3.3 and 11.6.3.4 could be increased with code updates.
2-CC-B-12-02-02	The proposed change adds a new Article 12.2.1.2. for voluntary airtightness testing of large building	Strongly support voluntary air tightness testing in 2019 for large buildings, however recommend moving mandatory testing to

	envelopes. Proposed changes would come into force on January 1, 2019 and reference the proposed updated Supplementary Standards for large buildings (SB-10A).	2020 (but with no requirement) and setting a more stringent requirement in 2022 (1.7-1.8L/s/m^2). The Code needs to focus on reducing air leakage at a time when it is relatively easy and financially feasible to do so; air leakage retrofits are much more difficult and expensive. Providing more stringent targets for future code updates is essential in achieving net zero carbon emission buildings. It is not explicit whether trade-offs for large buildings will be allowed until 2022 (more clearly outlined for Part 9 buildings, see comments in 2-CC-B-12-02-04). Recommend clearly limiting trade-offs to 10% (matching Part 9) until 2022 and eliminating then in 2022 (although envelope only trade-offs will be allowed).
2-CC-B-12-02-03	The proposed change adds a new Article 12.2.1.3. that removes existing exceptions related to insulation and the omission of thermal bridging effects from calculations. The proposed change will be added to the next edition of the Building Code and come into force on January 1, 2020.	Support the removal of exceptions when calculating certain thermal bridging effects, particularly in large buildings. Recommend proposed changes come into effect in January 2019 rather than January 2020.
2-CC-B-12-02-04	The proposed change adds a new Article 12.2.1.4. that contains requirements for air tightness testing, continuous insulation and fenestration U-values applicable to houses and small residential buildings. Changes will be added to the next edition of the Building Code and come into force on January 1, 2020.	Strongly support proposed air tightness changes as well as continuous insulation and minimum fenestration U-values (triple pane windows). Also support limiting trade-offs to 10% in 2020 and eliminating them by 2022 (after 2022 can still trade-off but only between envelope components). To reduce confusion, recommend matching air tightness requirements to those for large envelopes: 1) voluntary air tightness testing for 2019, 2) mandatory testing for 2020 (but with no requirement), and 3) testing with mandatory

		requirement for 2022. Max requirements 1.7-1.8L/s/m^2 can be achieved with this building type. Recommend increasing minimum continuous insulation levels from RSI 0.88 (~R5) to RSI 1.76 (R10), or alternatively proposing RSI 0.88 for 2020 and RSI 1.76 for 2022. Also recommend going to R22 effective in 2022. Consider banning spray foam insulation with high GHG intensity propellants, which can result in significant fugitive emissions (Vancouver has already done this). Passive House Planning Package (PHPP) is recommended as an acceptable modeling tool for compliance.
2-CC-B-12-02-05	The proposed change updates the energy efficiency requirements of the Building Code that come into force on January 1, 2022. The changes reference proposed updated Supplementary Standards for large buildings on the one hand and houses and small residential buildings on the other (SB-10B and SB-12B).	Supplementary standards currently reference 2013 ANSI and various compliance paths. However, they do not specify how targets will change beyond 2022. Recommend introducing performance targets for energy and GHG emissions as a compliance path as well as energy modeling provisions for various compliance paths. References to performance targets can provide line of sight beyond 2022 to net zero/net-zero ready in 2030. Recommend including provisions in 2019/2020/2022 for new construction that enable buildings to move away from fossil fuels (e.g. max heating temperatures for mechanical systems, electrical provisions for heat pumps etc.)

2-CC-B-12-05-01	The proposed change adds a new Section that requires at least one conduit to facilitate the future installation of a photovoltaic system or a solar domestic hot water system in houses and large buildings.	Support this recommendation. Recommend that in 2022 PV/solar DHW are installed on a min. of 25% of roof area with suitable solar access (suitable solar access will need to be defined).