



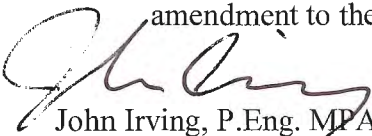
City of Richmond

Report to Committee

To: Public Works and Transportation Committee **Date:** April 11, 2017
From: John Irving, P.Eng. MPA **File:** 10-6125-07-02/2016-Vol 01
 Director, Engineering
Re: **BC Energy Step Code for New Private Buildings**



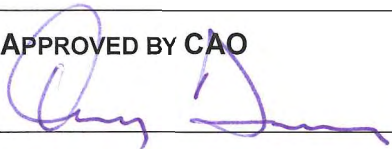
Staff Recommendations

1. That the stakeholder consultation program in the report titled "BC Energy Step Code for New Private Buildings" dated April 11, 2017, from the Director, Engineering, be endorsed for the purpose of gaining feedback on how the Energy Step Code can be implemented in Richmond;
2. That the air barrier installation training program identified in the report titled "BC Energy Step Code for New Private Buildings" dated April 11, 2017, from the Director, Engineering, be approved with \$60,350 funding from the Carbon Tax Provision;
3. That the funding for the air barrier installation training program be included as an amendment to the 5 Year Financial Plan (2017-2021).



John Irving, P.Eng. MPA
 Director, Engineering
 (604-276-4140)

Att. 2

REPORT CONCURRENCE		
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
Law	<input checked="" type="checkbox"/>	
Building Approvals	<input checked="" type="checkbox"/>	
Development Applications	<input checked="" type="checkbox"/>	
Policy Planning	<input checked="" type="checkbox"/>	
Finance	<input checked="" type="checkbox"/>	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: 	APPROVED BY CAO 

Staff Report

Origin

In June 2016, Planning Committee received a report entitled “Energy Policies for New Private Buildings Update,” dated May 12, 2016, noting staff’s participation in the Energy Efficiency Working Group at the invitation of the Province, with regard to the development of what was then termed a “Stretch Code.” The report noted that once outcomes of this process were defined staff would bring forward a report to Council for consideration regarding a High Performance Policy for New Private Buildings for the purposes of stakeholder consultation.

This report supports Council’s 2014-2018 Term Goal #4 Leadership in Sustainability:

Continue advancement of the City’s sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond’s position as a leader in sustainable programs, practices and innovations.

4.1. Continued implementation of the sustainability framework.

4.2. Innovative projects and initiatives to advance sustainability.

Background

Community Energy & Emissions

In 2010, Council adopted targets in Richmond’s Official Community Plan to reduce community-wide greenhouse gas (GHG) emissions 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050. The 2041 Official Community Plan also includes a target to reduce energy use 10% by 2020 below 2007 levels. Richmond’s 2014 Community Energy and Emissions Plan (CEEP) outlines an array of strategies and actions for the City to take to reduce community energy use and GHG emissions, including:

Strategy 2: Increase Energy Efficiency in New Developments

- **Action 4:** Promote energy efficiency in all rezoning.
- **Action 5:** Develop incentives for new development to exceed the building code energy requirements.

Modeling undertaken as part of the CEEP indicates that in order for Richmond to meet its emissions targets, all new buildings will need to be constructed to achieve zero carbon emissions by 2025. Thus, pursuing Carbon Zero Buildings is one of the “Big Breakthroughs” called for in the CEEP.

Current Energy-Related Requirements in Private Developments

A variety of existing City policies support energy performance in new developments, including:

- The “Sustainability Package” in the City Centre Area Plan
 - Leadership in Energy and Environmental Design (LEED™) Silver in City Centre – The 2009 City Centre Area Plan includes a policy that new developments over 2000m² undergoing rezoning achieve a minimum of LEED™ Silver performance.
 - District Energy Ready – New mixed use and residential developments located in areas of the City Centre where district energy systems may be established are expected to be developed with mechanical system that can connect into these systems. This requirement allows for provision of heating, cooling and domestic hot water energy to developments using low-carbon sources.
- Townhouse Energy Efficiency and Renewable Energy policy – Section 12.4, Objective 2 of the OCP sets out energy efficiency and renewable energy considerations for new townhouse developments resulting from rezoning applications. This policy was implemented in summer 2014, and was revised in fall 2015. As of January 19, 2017, 558 townhouse units had been approved under this policy, with Building Permits issued for 348 of these units and a number of townhouse projects fully constructed. The policy sets out a choice of four options that each townhouse unit must achieve for compliance:
 - Connect to a district energy utility (e.g. Alexandra District Energy Utility [ADEU] or Oval Village District Energy Utility [OVDEU]); or
 - Achieve an Energuide 82 energy performance rating (i.e. approximately 15% better than minimum BC Building Code performance); or
 - Achieve the requirements of the Energy Star for New Homes standard (i.e. approximately 22% better than minimum BC Building Code performance); or
 - Achieve the majority (at least 51%) of heating, cooling and/or electrical energy load requirements with on-site renewable energy systems (e.g. solar water heating, photovoltaic energy, geo-exchange).

There are currently no energy related requirements or policies applicable to large “Part 3” developments (e.g. buildings that are 4 or more stories or with a building footprint greater than 600 m²) outside of the City Centre Area Plan. Likewise, there are no energy requirements or policies applicable to detached houses or other small “Part 9” buildings (e.g. buildings of less than four stories and building footprints of less than 600 m²).

The Building Act

In 2015, the provincial government enacted the *Building Act* for the intended purpose of standardizing building regulations and their implementation throughout British Columbia. Section 5 of the Act stipulates that as of December 2017, local government building requirements enacted by means of bylaw will have no effect to the extent that they relate to provincial building regulations such as the BC Building Code. Provincial staff also stated that the

Building Act will not impact local government policies, nor negotiated agreements at time of rezoning secured by legal agreement. Thus, policies that apply to rezoning may be unaffected by the *Building Act*.

Climate Leadership Plan

In September 2015, Council directed that the City send a letter to the Province, outlining important elements that should be included in the Climate Leadership Plan, including action to reduce GHG emissions from buildings. In November 2015, Council directed that the City be a signatory to the “Call for Action on Energy and Climate in the Building Sector”, an initiative of the Pembina Institute, Urban Development Institute Pacific Region, and the Royal Architectural Institute of Canada, calling on the Province to establish a roadmap to achieve net zero energy ready new buildings in BC as part of the Climate Leadership Plan.

In the summer of 2016, the Province released the Climate Leadership Plan. While the Plan did not identify measures sufficient to achieve the Province’s 2020 and 2050 emission reduction targets, it did include important actions pertaining to the building sector, committing the Province to:

- Accelerating increased energy requirements in the BC Building Code by taking incremental steps to make buildings “net zero ready” by 2032.
- Developing the “BC Energy Step Code”, consisting of energy efficiency requirements for new buildings that go beyond those in the BC Building Code that interested local governments could implement in their communities.

Analysis

Issues with Current Energy Requirements for New Developments

Richmond has shown leadership by requiring beyond-code energy and green building performance of new construction. However, further City action is necessary for Richmond’s community GHG and energy reduction targets to be achieved. Currently, not all building types are subject to beyond-code energy performance policy, as only developments in the City Centre greater than 2000 m² and townhouse rezonings are asked to commit to beyond-code energy requirements. The CEEP makes clear that better energy performance is needed of all new developments.

Achieving the City’s goals requires higher performance than what is currently specified in City policy. The minimum energy performance requirements of the BC Building Code have advanced over time to the point where they are almost equivalent to LEED Silver for new large (“Part 3”) buildings. Referencing the BC Energy Step Code (described below) is expected to better achieve the City’s energy and emissions goals than LEED’s means of measuring energy performance.¹

¹ The City’s Sustainable “High Performance” Buildings Policy – City Owned Facilities (Council Policy 2307) requires that City owned facilities achieve LEED Gold certification including at least 10 energy performance credits. This is a higher level of performance than achieved with the minimum LEED pre-requisites and results in improved

The BC Energy Step Code

In response to concerns by local governments that the *Building Act* would prevent local governments from implementing GHG emission reduction measures in the building sector, the Province convened the “Stretch Code Implementation Working Group” (SCIWG) in the spring of 2016 to develop a consistent standard for energy efficiency performance that local governments could reference in requirements and policies, termed the BC Energy Step Code. A variety of stakeholders were represented in the SCIWG, including the Urban Development Institute, Canadian Home Builders Association, Greater Vancouver Home Builders Association, BC Hydro, FortisBC, Architectural Institute of BC, the Association of Professional Engineers and Geoscientists of BC, BC Housing, the Local Government Management Association, and other local governments. City of Richmond staff participated on the SCIWG. In November 2016, the Province released the consensus recommendations of the SCIWG.

On April 11, 2017, the Province announced its adoption of the BC Energy Step Code as a technical regulation. The BC Energy Step Code is a voluntary compliance path within the BC Building Code. It establishes progressive performance targets (or steps) that support market transformation from the current energy-efficiency requirements in the BC Building Code to net zero energy ready buildings by 2032. The Province also updated the *Building Act* General Regulation’s unrestricted matters list, allowing local governments to require the Energy Step Code in bylaw and/or reference it in policies and voluntary programs. The Province published a “Provincial Policy: Local Government Implementation of the BC Energy Step Code” document, outlining expectations for local governments’ application of the Energy Step Code consistent with the recommendations of the SCIWG. The SCIWG has now been renamed the “Energy Step Code Council,” and will continue to advise the provincial government on the further development of, and revisions to, the Energy Step Code going forward. A City staff person is on the Energy Step Code Council.

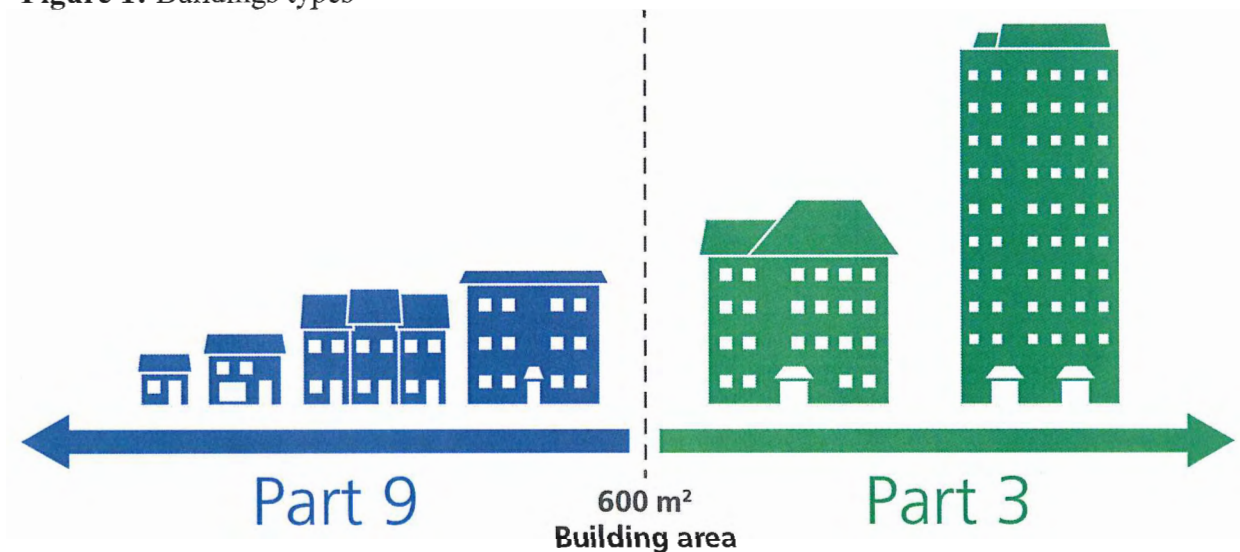
The BC Energy Step Code aims to provide consistency across BC by setting out a single set of building standards that can be voluntarily adopted by local governments. The BC Energy Step Code empowers local governments to take the lead in advancing building energy efficiency standards above and beyond the minimum requirements of the BC Building Code, as suitable for local development conditions. The BC Energy Step Code also reflects the consensus of stakeholders on the SCIWG on the need to shift away from extensive prescriptive regulations towards a target-based approach when setting energy-efficiency targets, as practiced in Europe.

The Energy Step Code consists of two broad sets of energy standards that respectively cover large “Part 3” buildings, and smaller “Part 9” residential buildings, as represented in Figure 1. Attachments 1 and 2 to this report respectively provide additional information on the technical requirements of the Energy Step Code for “Part 3” and “Part 9” buildings. Broadly, there are five steps for “Part 9”, four for “Part 3” residential buildings, and three for “Part 3” commercial and institutional.

environmental outcomes. Staff are evaluating the impact of other green building standards, including the Energy Step Code, on City owned facilities, as compares to the City’s current LEED policy.

Taken together, the “Steps” of the Energy Step Code form a framework by which the construction industry, over time, can incrementally “step up” to constructing new buildings at the near-net zero energy performance level that must be achieved if local, provincial and national GHG reduction targets are to be met. In this respect, the Energy Step Code represents a “Big Breakthrough” that can help enable the City, over time, to achieve the emissions reductions the CEEP identifies as necessary within the new building sector to achieve the City's climate action goals.

Figure 1: Buildings types



The table below summarizes how Richmond’s currently policies approximately align with the Energy Step Code.

	Current City Policy	Approximate Energy Step Code Performance Level
Part 9 Townhomes	Energuide 82, Energy Star, district energy, or 51% onsite renewables	~Step 2-3
Part 9 Other	B.C. Building Code	~Step 1
Part 3 (City Centre)²	LEED Silver equivalent	~Step 1-2
Part 3 (Outside City Centre)	B.C. Building Code	~Step 1

² Greater than 2000m²

How the Energy Step Code can be Used by Local Governments

Recognizing that builders, designers and trades will need to build capacity to construct higher performance buildings, the SCIWG's recommendations and subsequent provincial policy stress that during the early 2017-2020 phase of Energy Step Codes' implementation, local governments cite lower steps when setting bylaw requirements pertaining to all new construction in the community (Steps 1 through 3 for "Part 9" buildings; Steps 1 and 2 for most "Part 3" buildings, with Step 3 potentially also comprising a lower step for multifamily buildings 6 stories and less). The SCIWG recommended that a local government only make reference to higher steps if significant incentives are being offered; however, the City does not offer such incentives for energy performance. In later years, higher levels of performance could be referenced as requirements.

In addition to the type of development process and the level of incentives (broadly defined) available for new development, other aspects for consideration when considering options for implementing the Step Code requirements would include the following:

- **Building type:** Requirements for some Part 9 residential building types (e.g. townhouses) could differ from others. It should also be noted that the Part 9 Step Code has been developed with residential – rather than commercial and industrial – buildings in mind.
- **Size of houses:** Very small houses typically have lower heat retention, but higher occupancy rates per square meter. Conversely, very large homes may have low occupancy rates per square metre, resulting in higher per capita energy use.

The stated expectation of the SCIWG, echoed in the text of the Province's Climate Action Plan, is that as the construction industry familiarizes itself with new energy efficient building designs, methods, materials and technologies, local governments could gradually escalate requirements for new development under the Energy Step Code. Likewise, the BC Building Code will incorporate Steps in the Energy Step Code.

Opportunities to Limit GHGs

In addition to the Energy Step Code, specifying GHG emissions performance targets may support the City's climate objectives. The Energy Step Code encourages energy efficient buildings. Setting GHG targets would also encourage low-carbon energy sources, including renewable energy technologies such as air-source heat pumps or solar, in addition to energy efficiency. This GHG intensity metric is not included in the Energy Step Code. However, the City of Vancouver has adopted this metric as part of their "Zero Emissions Building Plan". The City of Richmond could reference this metric as a consideration of rezoning, which is not anticipated to be restricted by the *Building Act*. However, when applying the Energy Step Code as a requirement in bylaw, GHG intensity cannot be included.

Costs and Benefits

Some analysis has already been completed to develop a better understanding of the cost implications of different Energy Step Code performance levels for new Part 3 development. BC Housing is currently engaged in a detailed study of the costs associated with the Energy Step Code for both Part 3 and Part 9 construction. The results of the BC Housing study are expected in late spring 2017, and staff will use this information in local consultations with stakeholders and in developing recommendations regarding potential Energy Step Code policy regimes, pending Council’s support for the recommendations in this report.

Available cost information for both Part 3 and Part 9 buildings is summarized below.

Part 3 Building costs

The City undertook a study to estimate costs associated with the different performance steps. The analysis estimates the cost of construction to the Step Code and GHG intensity targets for different Richmond building archetypes constructed to BC Building Code levels of performance and “district energy ready”. The City’s study assumed more stringent requirements than what are currently referenced in the BC Energy Step Code regulation; this regulation may be updated, informed by findings from the BC Housing research noted above. Thus, this analysis may over-estimate the costs of achieving different tiers of the Energy Step Code, unless the provincial regulation is updated. Results are summarized in the table below.

	% decrease/increase in construction cost relative to BC Building Code			
	High Rise Residential	Low Rise Residential (wood frame)	Office	Retail
Step 1	N/A – Equivalent to current code			
Step 2	-0.7% to 1.3%	-1.0% to 1.1%	-0.5% to 0.2%	0.2% to 0.3%
Step 3	-0.4% to 1.6%	-0.8% to 1.3%	-0.5% to 0.2%	0.5% to 0.6%
Step 4	2.4 to 3.6%	-0.2% to 1.3%	TBD	0.7% to 1.0%

This analysis suggests that high performance buildings can be achieved at a modest first cost of construction, and often at no or even negative costs. Moreover, the analysis suggests that substantial life cycle savings for occupants from reduced energy costs are expected for a multifamily building; Steps 2 and 3 have lower total costs on a net present value basis than a building built to minimum BC Building Code requirements, when construction, maintenance and energy costs are considered.

Staff recommends that industry be engaged regarding their technical and financial capacity to build to different levels of the Step Code before performance requirements are finalized.

Part 9 Building Costs

While single detached homes are not currently subject to an energy efficiency policy, staff has estimated the cost for new detached homes complying with Step 1 requirements³ to be less than 0.15% of the cost of an average new detached home, or 0.4% of a new townhouse. Given that the City's existing townhouse energy efficiency policy already results in buildings that are on average 13% more energy efficient than minimum code requirements, staff anticipate the incremental cost of building to Step 3 ("20% better than code") will be only modestly higher than at present. These cost estimates will be updated once the results of the BC Housing study are available.

It should also be noted that the SCIWG intentionally designed Steps 2 through 5 of the Part 9 Step Code to facilitate the use of branded building energy certification standards by builders (i.e. Built Green, Energy Star for New Homes, R-2000 and Passive House standards respectively), in order to assist the construction industry in effectively marketing the increased performance of these better-built buildings.

Additional Benefits of Energy Step Code Buildings

New buildings built to Energy Step Code requirements will not only provide owners and occupants with reduced energy bills, and their communities with community greenhouse gas emissions, but significant additional benefits as well:

- **Comfort** – Buildings with high performance building envelopes typically are more comfortable, being less drafty and warmer near exterior windows and walls.
- **Quiet** – Better insulated buildings better attenuate sound, resulting in quieter indoor conditions. This can help achieve the City's Aircraft Noise policy requirements for achieving CMHC noise standards and ASHRAE internal building thermal comfort levels.
- **Indoor air quality** – Constructing high performance systems requires greater attention to building ventilation. Typically, high performance residential buildings will use either direct to unit ventilation or suite-by-suite heat recovery ventilation. These systems can better deliver fresh air than is typical of current ventilation practices.
- **Simple building systems and ease of maintenance** – Low thermal energy demand can allow for relatively simple building heating strategies. This can reduce the operations and maintenance, as well as the potential for expensive repairs, which are often associated with more complicated mechanical systems. Moreover, attention to quality building envelop construction can increase building durability.
- **Regional economic development** – The Step Code encourages high performance building envelopes. Insulation, windows and wood framing components that are often associated with better envelopes tend to be manufactured locally, providing opportunities for local businesses and jobs.

³ Using data provided by City of Vancouver, regarding the cost of home energy modelling and blower door tests.

- **Climate change adaptation** – The better building envelope design associated with the proposed approach can help ensure that buildings remain comfortable in the warmer climates anticipated in the future.

Proposed Airtightness training initiative for new Part 9 construction

Achieving improved levels of airtightness in new construction is a key objective of the Energy Step Code, as this is a major determinant of overall building energy efficiency. Staff have secured funding from BC Hydro to provide training to local homebuilders and buildings approvals staff on improved practices for installing air barriers in new home construction. If funded and approved by Council, this project would commence in Summer 2017 and run to the end of the year, prior to the earliest possible start of Step Code requirements in January 2018. This training program would run concurrently with the proposed consultation program in this report.

Preliminary Proposed Policy Approach

As noted above, the City’s existing energy related rezoning requirements are inconsistent with the objectives of the *Building Act*. In light of the improved performance associated with the Energy Step Code, it is intended that the City’s current requirements be updated to reference the Energy Step Code. Existing reference to LEED Silver in the CCAP would be removed, and the range of options for compliance with the Townhouse Energy Efficiency and Renewable Energy policy would be revised. City-wide OCP rezoning policies and/or bylaw requirements referencing the Energy Step Code would replace these existing requirements. The table below outlines a preliminary proposed regime, for the purposes of stakeholder consultation.

	Current Approximate Energy Step Code Performance Level	Preliminary Proposed Step – for Stakeholder Consultation		
		2018	~2021	~2025
Part 9 townhomes	~Step 2-3	Step 2 or 3	Step 3 or 4	Step 4 or 5
Part 9 detached homes, duplex	BC Building Code	Step 1	Step 3	Step 4
Part 3 residential >6 story	~Step 1-2 (in City Centre) BC Building Code (outside CC)	Step 2	Step 3	Step 4
Part 3 residential ≤ 6 story	~Step 1-2 (in City Centre) BC Building Code (outside CC)	Step 2 or 3	Step 3 or 4	Step 4
Part 3 commercial	~Step 1-2 (in City Centre) BC Building Code (outside CC)	Step 2	Step 3	Step 3

The stakeholder consultation program outlined below will help determine the specific levels of Energy Step Code performance that are to be referenced as part of City requirements and policy.

The “Provincial Policy: Local Government Implementation of the BC Energy Step Code” document requests that local governments that are considering requiring Steps in the Energy Step Code notify the Energy Step Code Council. This is intended to provide the Energy Step Code Council with up-to-date information on Energy Step Code-related activity in the Province, to help ensure an orderly roll-out. Staff will notify the Energy Step Code Council if this report is ratified by Council.

Building Energy Specialist Position and Staffing Requirements

Upon completion of stakeholder consultation, staff will bring forward a report with recommendations regarding Energy Step Code adoption. This report may include a recommendation to create a Building Energy Specialist position to implement the Energy Step Code and related efforts to secure compliance with code energy requirements. This position would be within the Sustainability section in the Engineering Department and will work with the Building Approvals Department. Key tasks will include implementing policy compliance regimes for the Energy Step Code, training staff and industry stakeholders, and administering building reporting databases. BC Hydro offers \$50,000 per year to support this position, similar to corporate and community energy manager funding currently received from BC Hydro. Net costs could be offset through permit fees. Impacts on Building Approvals resources will also be evaluated as part of developing the City’s Energy Step Code compliance regime.

Stakeholder Consultation Program

It is recommended that Council endorse a stakeholder consultation program to develop options for an Energy Step Code policy regime for Council’s consideration, and associated amendments to the City’s existing building energy policies. This process will review the Step Code framework and possible policy regime with pertinent stakeholders; review impacts on development form and cost; develop, gather feedback on and refine the policy; and identify complementary supports for more energy efficient development. Staff are proposing stakeholder engagement with the following groups using the following methods:

- Small Builders Group at regularly scheduled meetings with staff;
- Greater Vancouver Home Builders Association as part of the Small Builders meetings;
- Urban Development Institute at regularly scheduled meetings with staff;
- Advisory Committee on the Environment at scheduled meetings with staff;
- Energy utilities (including BC Hydro, FortisBC and Lulu Island Energy Company) through direct engagements;
- Building industry stakeholders, including the Architectural Institute of BC, Association of Professional Engineers and Geoscientists of BC, BC Construction Association, the Homeowners Protection Office, and non-governmental associations (including the Canadian Green Building Council, Lighthouse Sustainable Building Centre, and Pembina Institute) in a large multi-stakeholder workshop;
- Certified Energy Advisors in a focus group meeting.

Following consultation, staff will bring forward proposed amendments to the Official Community Plan and any other bylaws to implement the Energy Step Code policy regime.

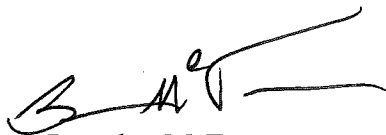
Financial Impact

The air barrier training program for Building Approvals staff and local builders will cost \$60,350, including \$16,000 for materials and project management salary, funded through the City’s Carbon Tax Provision that is dedicated for community energy programs and projects. BC Hydro has granted \$13,725 toward the cost of this program, which would be returned to the Carbon Tax Provision upon receipt of the grant. Staff shall execute any necessary related agreements to deliver the air barrier installation training program per the City’s purchasing policy, and the City’s 5 Year Financial Plan (2017-2021) will be amended accordingly.

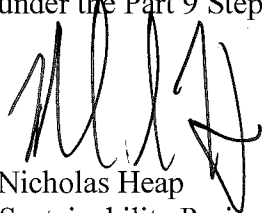
Following stakeholder consultation, staff will bring forward a report recommending the Energy Step Code policy regime and associated bylaw amendments, and a recommendation on whether to create the Building Energy Specialist position and/or additional Building Approvals resources.

Conclusion

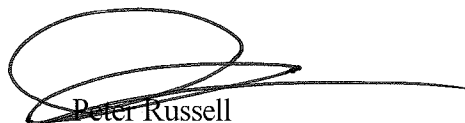
The Energy Step Code is an important development that will enable the City to advance large-scale and cost-effective GHG emission reductions throughout the community. The Energy Step Code provides a pathway by which the construction industry, over time, can incrementally “step up” to the near-net zero energy performance level that must be achieved if local, provincial and national greenhouse gas reduction targets for 2050 are to be achieved. This report proposes an Energy Step Code framework for the purposes of stakeholder consultation. Following public consultation, staff will bring forth a recommended policy package, including required Official Community Plan Bylaw No. 9000 and Bylaw No. 7100 amendments. The report also recommends that staff implement an air barrier installation training initiative for staff and local builders during 2017 to build implementation capacity for a key energy efficiency requirement of new residential construction under the Part 9 Step Code.



Brendan McEwen
Sustainability Manager
(604-247-4676)



Nicholas Heap
Sustainability Project Manager
(604-276-4267)



Peter Russell
Senior Manager,
Sustainability & District Energy
(604-276-4130)

Attachment 1: Energy Step Code for new Part 3 Buildings – Summary of Technical Requirements

Part 3 Construction

The Energy Step Code for large “Part 3” buildings (e.g. buildings that are 4 or more stories and greater than 600m²) involves a number of technical requirements, including:

Steps 1 to 4 - Adherence to an “Enhanced Compliance Package”, involving:

- **Energy modeling for all projects.** All projects will be required to produce an energy model of the building to confirm that it exceeds minimum energy and emissions targets. The Step Code references Energy Modeling Guidelines outlining standardized assumptions, acceptable modeling software, and processes. These Guidelines ensure a fair “apples to apples” evaluation of building performance. Energy models will be professionally signed and sealed. Submission of an energy model to the City is already required as part of district energy connection approvals, and a large percentage of buildings undertake energy modeling for LEED and/or Building Code compliance.
- **Whole building air-tightness testing.** Developments will be required to conduct a test of their air-tightness. At first, testing will be used to baseline performance. In subsequent years, the City may change to require specific air-tightness targets. Various jurisdictions already have mandatory air tightness testing, including the City of Vancouver (for homes), the State of Washington (for all buildings), and many European countries.
- **Energy commissioning requirements.** Commissioning of building equipment and systems is a quality assurance process that ensures that systems are able to operate as designed. The Stretch Code may include requirements for commissioning energy systems; alternately, expectations for commissioning in the BC Building Code may be clarified.
- **Building energy reporting.** Developments will be required to create an Energy STAR Portfolio Manager account used to track energy performance, and share it with the City. This will allow for future policy evaluation. The Portfolio Manager tool is widely used and considered the *de facto* energy reporting and benchmarking system, with over 20% of commercial floor space in Canada using the tool, and over 40% in the USA. The City uses Portfolio Manager to measure performance in its own larger buildings. Participation in the City’s Building Energy Challenge program relies on energy reporting with Portfolio Manager, with 95 buildings representing 7.1 million square feet of property currently sharing their account with the City.

Steps 2 to 4 - Exceeding minimum energy performance targets. In addition to the “enhanced compliance package” required of Step 1, developments will be required to exceed minimum energy performance targets. Different performance targets exist for different building types, including residential, office, retail, and hotel. Performance targets for mixed use buildings are pro-rated based on floor area. Targets include:

- **Thermal energy demand intensity (kWh/m²/year)** – The annual modeled thermal energy required to provide space heating for a development. This target encourages energy efficient building envelope and passive design features, to limit heating requirements.
- **Total energy use intensity (kWh/m²/year)** – The total annual modeled energy demand of a development. This target encourages all building systems to be energy efficient.

Additional option for consideration: Greenhouse gas intensity (kg CO₂e/m²/year) – The total annual greenhouse gas emissions from a development. This metric encourages efficiency, and low-carbon energy sources, including renewable energy. This metric is not included in the Provincial Step Code. However, the City of Vancouver has adopted this metric as part of their “Zero Emissions Building Plan”. The City of Richmond could reference this metric as part of policy applied to buildings undergoing rezoning, which is not anticipated to be restricted by the *Building Act*. However, when applying the Stretch Code as a requirement in bylaw, GHG intensity cannot be included.

Energy Step Code performance levels are summarized in the tables below. The specific targets cited in the Energy Step Code may be adjusted over time, as additional information becomes available, notably the BC Housing study now underway.

Energy Step Code Performance Levels for Residential Occupancies		
	Equipment and Systems – Maximum Total Energy Use Intensity (kWh/m ² /yr)	Building Envelop – Maximum Thermal Energy Demand Intensity (kWh/m ² /yr)
Step 1		
Step 2	130	45
Step 3	120	30
Step 4	100	15

Energy Step Code Performance Levels for Business and Personal Services or Mercantile Occupancies		
	Equipment and Systems – Maximum Total Energy Use Intensity (kWh/m ² /yr)	Building Envelop – Maximum Thermal Energy Demand Intensity (kWh/m ² /yr)
Step 1		
Step 2	170	30
Step 3	120	20

Attachment 2: Energy Step Code for new Part 9 Buildings – Summary of Technical Requirements –

All five steps of the Part 9 Step code require two basic “Enhanced Compliance” measures, which are not required under the BC Building Code:

- Energy modelling of the building is required at the design stage, in order to confirm that the structure as designed will achieve the Step Code targets.
- “Air-tightness” testing is also required once the building has been constructed, in order to measure uncontrolled flows of heat and moisture⁴ in and out of the building.

Beyond this, each tier of the Part 9 Step Code sets out three performance targets:

- The air-tightness of the completed building, usually measured in terms of air changes per hour when the home is pressured and depressurized by a defined amount.
- Mechanical energy performance – projects must meet performance thresholds for one of the following two metrics:
 - Mechanical Energy Use Intensity (MEUI) of the building.
 - Percentage reduction in total energy use relative to the same home built to BC Building Code minimum standards as measured by the Energuide Rating System’s reference house.
- Building envelope performance – projects must meet performance thresholds for one of the following two metrics:
 - Thermal Energy Demand Intensity (TEDI) which measure annual energy demand for heating a space.
 - Peak Thermal Load (PTL) which measure peak heat loss through the building envelope.

The table below summarizes Part 9 Energy Step Code requirements for Climate Zone 4, which includes Metro Vancouver.

⁴ Mostly as water vapour

Part 9 Step Code Requirements for Climate Zone 4 (Lower Mainland and southern Vancouver Island)

	Airtightness (Air changes per hour at 50 Pa Pressure Differential)	Performance Requirements for Building Equipment and Systems	Performance Requirements for Building Envelope
Step 1	NA	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption - or - conform to Subsection 9.36.5.	
Step 2	≤ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption - or - mechanical energy use intensity $\leq 60 \text{ kWh/m}^2 \cdot \text{year}$	thermal energy demand intensity $\leq 45 \text{ kWh/m}^2 \cdot \text{year}$ - or - peak thermal load $\leq 35 \text{ W/m}^2$
Step 3	≤ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption - or - mechanical energy use intensity $\leq 45 \text{ kWh/m}^2 \cdot \text{year}$	thermal energy demand intensity $\leq 40 \text{ kWh/m}^2 \cdot \text{year}$ - or - peak thermal load $\leq 30 \text{ W/m}^2$
Step 4	≤ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption - or - mechanical energy use intensity $\leq 35 \text{ kWh/m}^2 \cdot \text{year}$	thermal energy demand intensity $\leq 25 \text{ kWh/m}^2 \cdot \text{year}$ or peak thermal load $\leq 25 \text{ W/m}^2$
Step 5	≤ 1.0	mechanical energy use intensity $\leq 25 \text{ kWh/m}^2 \cdot \text{year}$	thermal energy demand intensity $\leq 15 \text{ kWh/m}^2 \cdot \text{year}$ or peak thermal load $\leq 10 \text{ W/m}^2$

Viewed together, the five Steps of the Step Code span the large performance gap between current BC Building Code minimum requirements and the highest levels of building energy performance yet achieved in British Columbia.

- **Step 1** is quite literally intended to be a “first step” on the road to improved building energy efficiency performance, for communities and/or segments of the building market with limited previous requirements for building energy efficiency. Step 1 energy performance targets are modest, requiring only that that building achieve the same energy performance as the intended performance of a building built to minimum BC Building Code requirements. As noted above, however, achieving this target requires builders to do energy modeling, and install air-barriers in an effective manner, skills that are essential to achieving success at higher levels of the Step Code. Staff have developed a project leveraging BC Hydro funding to provide training in airtightness construction techniques for home and townhouse builders active in Richmond.
- **Step 2** calls for homes only 10% more efficient than that expected with Building Code minimum requirements, and a required air-tightness of 3.0 ACH50. Step 2 is best characterized a half-step relative to the larger jumps in performance between higher tiers. A home meeting the Step 2 standard would have comparable energy performance to that of a “Built Green”® home.
- A new home built to the **Step 3** standard would have an overall energy performance 20% better than one built to Building Code minimum requirements, and an airtightness of 2.5 ACH – i.e. about half that of the average actual performance of buildings currently built to minimum BC Building Code requirements. The overall energy target for this Step is a close match to two of the four available options under the City’s existing townhouse energy efficiency policy. Based on modeling information available to date, townhouses in Richmond designed to achieve an EnerGuide 82 rating are, on average, 13% more efficient than those built to code minimum requirements, while homes built to the Energy Star for New Homes standard are expected to be 22% more energy efficient than a minimally code compliant home.
- The **Step 4** standard is comparable to the energy performance of a home to Natural Resources Canada’s R-2000 ® standard. Homes meeting this standard would use 40% less energy than the expected performance of a minimally code compliant home, and have an airtightness of 1.5 ACH50 or better – less than a third of the average new home built to minimum building code requirements
- The **Step 5** standard approaches the performance required by the stringent “Passive House” standard, and broadly matches the level of energy performance that the Climate Leadership Plan has committed to for new construction in 2032. Homes achieving Step 5 would use less than half of the energy of a minimally code compliant home, and an airtightness level of just 1.0 ACH₅₀. At present, achieving this level of energy performance is exceptional: the Passive House database currently lists only 21 buildings in BC (of which 8 are “Passive House” certified). None are located in Richmond.⁵

⁵ <http://www.passivhausprojekte.de/index.php?lang=en>