BC Energy Step Code

A Best Practices Guide for Local Governments

BRITISH COLUMBIA

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A publication of the Energy Step Code Council and the Building and Safety Standards Branch.

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- The BC Innovative Clean Energy (ICE) Fund
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Energy Step Code Council Members

This Guide was made possible through the generous input and contributions from numerous organizations:

Letter from the Executive Director of the Building and Safety Standards Branch

The British Columbia Energy Step Code and this local government best practices guide represent an important milestone for energy efficient buildings and climate leadership in British Columbia. They are excellent examples of collaboration between the Province, local governments, the construction industry, professional associations, energy utilities, and other stakeholders.

As the information in this guide demonstrates, improving energy efficiency requires careful consideration of long-term affordability, consumer acceptance, capacity in the industry, and other conditions that can be unique to each community.

The Building and Safety Standards Branch is committed to the ***Building Act*** objective of improving the consistency of technical building requirements in British Columbia, while supporting local governments in pursuing improved energy efficiency and reducing greenhouse gas emissions from buildings.

The ***BC Energy Step Code*** provides local governments with another tool to achieve their policy objectives, while also providing the construction industry with a single set of consistent standards for energy efficiency across British Columbia. This improved consistency ensures that as we innovate with energy efficient designs, we are also avoiding unnecessary costs associated with the current patchwork of unique standards to each community – enabling a balance of energy efficiency and housing affordability. Much effort has been invested by the Energy Step Code Council to establish a consensus approach to responsible implementation of the ***BC Energy Step Code***, reflected in this guide.

I would like to acknowledge the significant contributions of all those involved in the development of this guide, and I look forward to continuing in the spirit of open collaboration in the future.

Andrew Pape-Salmon, P.Eng., MRM, FCAE
Executive Director, Building and Safety Standards Branch
Office of Housing and Construction Standards
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Executive Summary

In April 2017, the Province of British Columbia adopted the BC Energy Step Code as regulation. The new standard is a tool designed to help both government and industry chart a course to a future in which all new construction across the province is "net-zero energy ready" by 2032.

By gradually adopting one or more steps of the new standard, local governments can steadily increase building performance, helping the Province and communities meet their energy conservation and greenhouse gas reduction goals. Along the way, they will facilitate demand for energy-efficient buildings, help the market mature, and grow industry capacity for high-performance products and practices across British Columbia.

The Energy Step Code Council, a multi-stakeholder body tasked with facilitating the implementation of the ***BC Energy Step Code***, believes the standard will enjoy a greater chance of success if local governments implement it thoughtfully and prudently, with attention to appropriate incentives and industry capacity.

For this reason, the Energy Step Code Council strongly encourages local governments to follow the practices and processes outlined in this Guide – for the benefit of all. The pages that follow outline a wealth of information on the ***BC Energy Step Code***. The recommendations are not regulatory requirements and not intended as legal advice regarding the authorities of local governments and Authorities Having Jurisdiction under the ***Local Government Act*** or the ***Community Charter***.

Here are some of the most important considerations:

- The ***BC Energy Step Code*** is a **performance-based standard**. It establishes measurable requirements for energy efficiency in new construction. To demonstrate compliance, a builder must prove to local building officials that the building meets or exceeds a set of defined metrics for building envelope, equipment and systems, and airtightness testing.
- British Columbia local governments may now reference the standard in their policies and bylaws, and may enforce requirements as of **December 15, 2017**. As of that date, bylaws that reference other technical building standards or green-building programs will be unenforceable, due to Section 5 of the ***Building Act*** coming into force. The Energy Step Code Council is encouraging those governments that have such programs in place to convert them to reference the ***BC Energy Step Code***.
- The **Energy Step Code Council** exists to support local governments as they develop a ***BC Energy Step Code*** strategy. The Energy Step Code Council has no regulatory authority; rather, it serves as a "bridge" between local governments, the Province, and the design, building, development, and construction sectors, offering advice and providing support and resources, such as this Guide.
- Local governments who choose to pursue establishing the ***BC Energy Step Code*** in their communities may select from a **broad spectrum of policy tools** including tools that raise awareness, provide incentives, institute bylaw requirements, remove barriers to energy efficient building, and/or demonstrate leadership. Each jurisdiction will need to select the tools most suitable to its community.
- If your local government is considering referencing one or more steps, you will need to establish a **consultation process with appropriate stakeholders** to select a strategy that will be successful for your community, including obtaining input to define the: policy and/or incentive tool(s), building type(s), geographic scale, and step(s).
- When developing your strategy, it is vital to provide your staff and industry **sufficient time and notification** to prepare for change. In particular, industry should be notified of consideration of a new program implementing Lower Steps jurisdiction-wide at least six months prior to enforcement. Other timelines apply to other circumstances and instances of referencing the steps and are detailed within this Guide.
- Your government can demonstrate leadership in the transition to net-zero energy ready buildings by **constructing new civic buildings to the Upper Steps**, and by encouraging those who are overseeing the development of new provincial and federal buildings in your community to do the same.

The above points represent just a sample of the advice and explanation you will find within this Best Practices Guide. We hope this document serves as a valuable resource as you work to access the co-benefits of high-performance buildings while ensuring industry in your community has a head start on the future direction of the ***BC Building Code***.

To stay abreast of additional resources as they come available, be sure to visit **energystepcode.ca**.

Kwayatsut concrete high-rise apartment building at Broadway and Fraser, Vancouver, BC (Part 3, Step 3)

Photo: North Park Passive House, Victoria, BC (Part 9, Step 5)

About This Document

This ***Best Practices Guide*** (Guide) is a resource for all local governments in British Columbia that are interested in referencing the ***BC Energy Step Code*** in policies, programs, or bylaws. For the Guide, **local governments** include: municipalities, regional districts, and the University of British Columbia Board of Governors who administer the ***BC Building Code.*** The ***BC Energy Step Code*** applies to the same jurisdictions as the ***BC Building Code*** and does not apply to construction in the City of Vancouver, on First Nations land, or on Federal land.

The ***BC Energy Step Code*** is a new standard designed to help both government and industry chart a course to a future in which all new construction across the province is "net-zero energy ready" by 2032, as identified in the ***BC Climate Leadership Plan***.[1] By gradually adopting one or more steps of the standard, local governments can increase building performance requirements in their communities. They can do so at an appropriate pace for their communities, enabling demand to grow, the market to mature, and industry capacity to increase as services and products for the design and construction of high-performance buildings become more widely available. The ***BC Energy Step Code*** provides more consistency to industry, establishing a standard set of performance requirements, while offering local governments a simple and effective set of standards to support their energy conservation and greenhouse gas reduction goals.

This Guide is for local government staff members and elected officials who are starting out along that path. It delves into the nuts and bolts of the standard, and offers context and clear information on the characteristics of each step. It highlights anticipated costs and benefits and offers guidance on suggested timelines and effective engagement for developing a community-specific strategy for implementing the ***BC Energy Step Code***.

The new standard will have a greater chance of success if local governments implement it thoughtfully, with due care to stakeholder engagement, appropriate incentives, and industry capacity. For this reason, local governments are strongly encouraged to follow the best practices outlined in this Guide. While local governments are strongly encouraged to adopt the best practices outlined here – for the benefit of all – local governments are autonomous in the exercise of their lawful authorities.

If you are a local government staff member or elected official and cannot find an answer to your concern or question in this Guide, please visit energystepcode.ca, where resources will continue to be shared as they become available. For policy and technical questions, please contact the Building and Safety Standards Branch at building.safety@gov.bc.ca.

Finally, a series of illustrated guides to support industry in meeting the ***BC Energy Step Code*** will also be available at energystepcode.ca to support your community's building, design, construction, and development sectors.

1. https://climate.gov.bc.ca/

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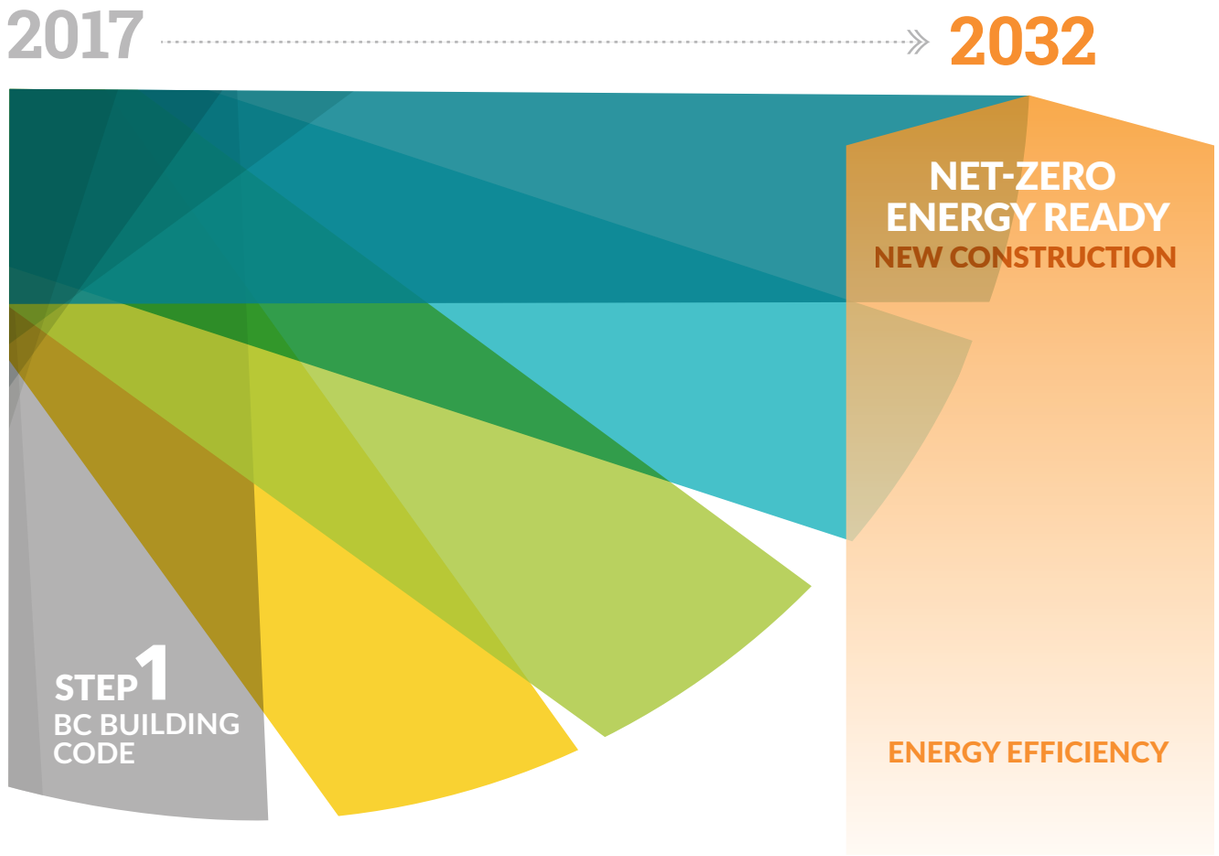
1 Introducing the BC Energy Step Code

1.1 What is the BC Energy Step Code?

The ***BC Energy Step Code*** is a provincial standard enacted in April 2017 that provides an incremental and consistent approach to achieving more energy-efficient buildings that go beyond the requirements of the base ***BC Building Code***. This new standard is a vital measure to enable BC to meet the Provincial goal to construct net-zero energy ready buildings by 2032. It does so by establishing a series of measurable, performance-based energy-efficiency requirements for construction that communities may choose to adopt when ready.

The BC Energy Step Code groups these energy-efficiency requirements into a series of "steps."

Step 1 entails modelling energy performance and measuring airtightness to ensure that a building will meet or exceed the minimum energy-efficiency requirements in the base ***BC Building Code***. Meanwhile, at the opposite end of the scale, the highest step represents a "net-zero energy ready" standard – a standard that is being met by the most energy-efficient projects being developed today.



The ***BC Energy Step Code*** also aligns with the Government of Canada's ***Pan-Canadian Framework on Clean Growth and Climate Change***. That framework establishes a goal that provinces and territories adopt a net-zero energy ready model building code by 2030; the ***BC Energy Step Code*** provides a path to incrementally prepare British Columbia for this coming change.

The ***BC Energy Step Code*** provides more consistency to industry, establishing a standard set of performance requirements, while offering local governments a simple and effective set of standards to support their energy conservation and greenhouse gas reduction goals. It also supports co-benefits such as improved occupant comfort, lower utility bills, and reduced noise inside buildings.

Local governments in BC (except the City of Vancouver) may now reference the ***BC Energy Step Code*** in their policies and bylaws, and may begin enforcing requirements as of **December 15, 2017**.[1] This Guide provides notification timelines and guidance for completing appropriate consultation and preparation prior to beginning enforcement of the ***BC Energy Step Code***.

The ***BC Energy Step Code*** is also available for industry to voluntarily adopt as a compliance path in the ***BC Building Code*** by meeting the minimum performance set out in Step 1 (or the Step set out in the applicable local bylaw).

1. The City of Vancouver sets its own building efficiency standards, within the Vancouver Building Bylaw, under the Vancouver Charter. The BC Energy Step Code uses an approach to measuring energy performance that is similar to that used by the City of Vancouver for many building types. This will help align energy standards across the province.

What is a Net-Zero Energy Ready Building?

Net-zero energy buildings produce as much clean energy as they consume. They are up to 80 percent more energy efficient than a typical new building, and use on-site (or near-site) renewable energy systems to produce the remaining energy they need. A net-zero energy ready building is one that has been designed and built to a level of performance such that it could, with the addition of solar panels or other renewable energy technologies, achieve net-zero energy performance.

Highly energy-efficient home currently under construction in Kelowna, by Marken Design + Consulting (Part 9, Step 5)

Highly energy efficient wood-frame residential building under construction in Vancouver (Part 3, Step 4)

“We've just updated our Official Community Plan, and this iteration includes new land-use zoning and building-design guidelines. In the coming year, staff will be putting into practice new energy-related planning policies that reference various steps of the BC Energy Step Code. In the meantime, we're engaging our local homebuilder, developer, and design community on the new standard, and the benefits it brings us – namely buildings that perform better.

Norm Connolly, Community Energy Manager, City of New Westminster

Photo: Two infill homes by a builder participating in Natural Resources Canada's Local Energy Efficiency Partnership (LEEP), New Westminster, BC. (Part 9, Step 4; Energy Star Rating; R2000 Rating)

Supporting Local Government Climate Action

Since 2010, Sections 429(2)(d) and 473(3) of the ***Local Government Act*** have required that all new and updated Regional Growth Strategies and Official Community Plans include targets, policies, and actions to address climate change. Further, most local governments in BC have signed on to the Province's ***BC Climate Action Charter,*** which commits signatory local governments to a range of actions, including developing strategies and taking action to achieve “complete, compact, more energy-efficient rural and urban communities.”

Many local governments have adopted policies, bylaws, and incentive programs that seek to improve building energy efficiency, because a significant portion of a community's greenhouse gas emissions typically result from heating buildings.[1] These programs each define efficiency using different approaches, which has created a patchwork of requirements within the province. This makes it more challenging for professionals and trades that design and construct buildings to keep track of what the various standards require and where they apply.

To improve consistency across the province, **Section 5 of the Building Act will make local bylaws that establish technical building requirements unenforceable, effective December 15, 2017, unless the requirements are for “unrestricted matters,” which include the *BC Energy Step Code*.**[2] The *BC Energy Step Code* provides a tool for local governments to encourage or enforce a higher energy-efficiency standard, by incorporating the ***BC Energy Step Code*** into the ***BC Building Code***. New policies and bylaws referencing the ***BC Energy Step Code*** may become enforceable starting December 15, 2017. This provides greater consistency and clarity across different jurisdictions using one standard, with multiple levels of efficiency.

1. BC Community Energy and Emissions Inventory 2012 (CEEI), BC Ministry of Environment.

2. Section 5 came into force on December 15, 2015, but due to the transition period imposed by section 43 of the Act, it does not apply until December 15, 2017. Unrestricted matters are described further here: http://www2.gov.bc.ca/gov/content/industry/construction-industry/building-codes-standards/building-act/consistency.

Supporting Industry Leadership

Builders anywhere in the province can voluntarily use the ***BC Energy Step Code*** as a new compliance path for meeting the energy efficiency requirements of the ***British Columbia Building Code.***

A number of the province's builders already build to advanced performance standards voluntarily. However, with notable exceptions, high-performance buildings remain a niche product. The ***BC Energy Step Code*** provides a consistent approach that allows the market to gradually build capacity and skills, and reduce costs over time.

Supporting a Green Economy

Research shows the global green-building market doubles every three years and the value of the green building materials market is expected to reach $234 billion by 2019.[1] [2] BC is already a green building design and construction leader, boasting some of highest-performing buildings in North America. According to recent research, almost 12,000 people work in green architecture and related construction services in BC, while close to 9,000 work in clean energy services.[3] The ***BC Energy Step Code*** could open up new local economic development opportunities, and help unlock a significant export opportunity.

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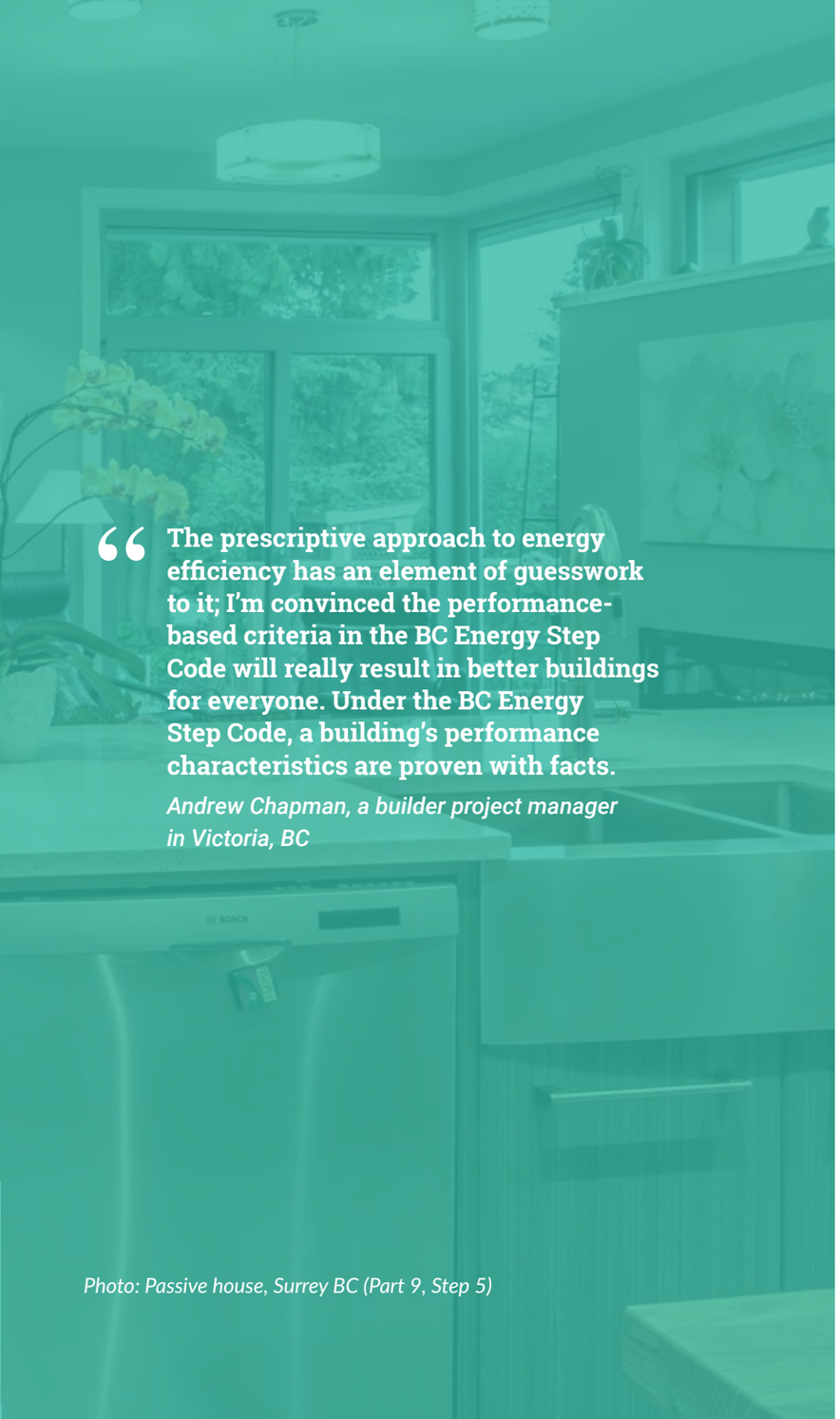
1 "World Green Building Trends 2016, Developing Markets Accelerate Global Green Growth," World Green Building Council.

2 "Green Building Materials Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast, 2013 – 2019," Transparency Market Research.

3 "West Coast Clean Economy: 2010-2014 Jobs Update," Delphi Group, November 2015.

Pre-fabricated walls being manufactured at a facility in Agassiz, BC, photo by Monte Paulsen (Part 9, Step 5)



> **The prescriptive approach to energy efficiency has an element of guesswork to it; I'm convinced the performance-based criteria in the BC Energy Step Code will really result in better buildings for everyone. Under the BC Energy Step Code, a building's performance characteristics are proven with facts.**
>
> *Andrew Chapman, a builder project manager in Victoria, BC*

Photo: Passive house, Surrey BC (Part 9, Step 5)

1.2 Preparing for Net-Zero Energy Ready Buildings by 2032

Shifting to a Performance-Based Approach

The Province of British Columbia first introduced energy efficiency as a requirement in the ***BC Building Code*** in 2008. Since that beginning, designers and builders have had the option to take either prescriptive or performance approaches to code compliance.

To date, the vast majority of buildings in BC have demonstrated compliance through a "prescriptive" approach – where buildings must meet specific requirements for insulation, windows, furnaces, water heaters, lighting, and other equipment and systems. This approach focuses on individual elements, rather than ensuring the building functions well as a system. The result can be a building that meets prescriptive requirements but does not perform as well as intended.

A "performance" approach has been the second option for complying with the energy efficiency requirements in the ***BC Building Code***, and a specific form of the performance approach is required for the ***BC Energy Step Code***. **The performance approach establishes a desired outcome, and leaves it to the design and building team to decide how to achieve the outcome.**[1] **Whole-building energy modelling and on-site testing are required to demonstrate how the design, and how the constructed building, meet the requirements in the code, but there are no requirements regarding what materials or construction methods need to be used.**

This echoes the approach taken by most green building programs, including Natural Resources Canada's Energy Star for New Homes and R-2000 programs, and The Canadian Passive House Institute Passive House certification, as well as the Canadian Home Building Association's Net Zero Home and Net Zero Ready Home labels.

1. For more information on the difference between prescriptive and performance approaches, refer to "Understanding BC's Building Regulatory System" (p7). http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/guides/buildingactguide_sectiona1_june2015_web.pdf

Over time, the building industry will integrate these techniques into all new buildings as high-performance designs, materials, and systems become increasingly available and cost-effective. **By 2032, the BC Building Code will move towards the higher steps of the *BC Energy Step Code* as a minimum requirement. The National Building Code of Canada will also be moving towards this outcome by 2030.**

Collaboration to Support the Path to Net-Zero Energy Buildings

Between 2014 and 2017, the Province launched a series of consultations to engage with the building and development sectors – and the trades and professions that support them – as well as local governments, utilities, and other stakeholders, to identify a consistent approach to increasing energy-efficiency standards. The consultations worked towards consensus on the core elements of what would become the ***BC Energy Step Code***.

The Energy Step Code Council and the Province: Role and Mandate

The Province holds regulatory authority with respect to the ***BC Energy Step Code***. As identified in the ***Provincial Policy: Local Government Implementation of the BC Energy Step Code*** (***Provincial Policy***), the Province established the Energy Step Code Council (ESCC) with a mandate to support the successful implementation of the ***BC Energy Step Code***, and the market transition to net-zero energy ready buildings. Members of the ESCC were involved in the Province's consultations during the development of the ***BC Energy Step Code***.

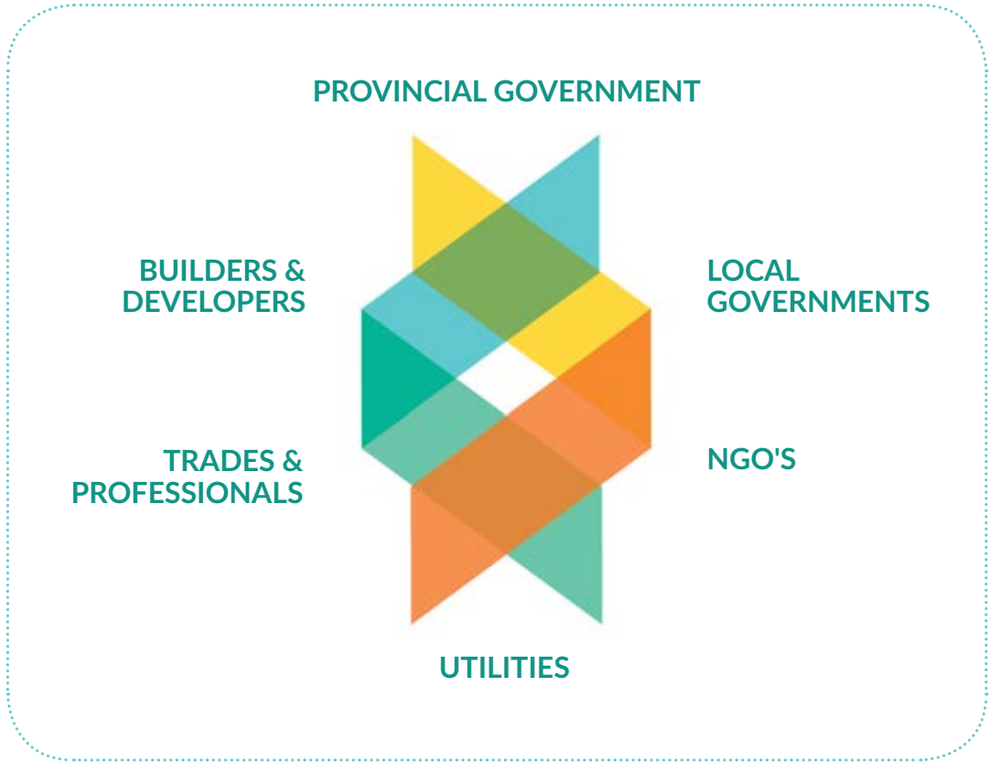
The Province will continue to obtain input from the ESCC, which serves as a "bridge" between the Province, utilities, local governments, and the design, building, development, and construction sectors, to ensure local governments adopt steps of the ***BC Energy Step Code*** in a responsible manner. The ESCC will monitor impacts on housing affordability and rates of implementation by local governments, and will address

unintended consequences that may arise. The ESCC also establishes best practices for the local government sector to support local governments in the judicious use of the ***BC Energy Step Code***. The Province may act to resolve issues that arise. Issues identified by the ESCC may also inform future changes to the technical content of the ***BC Energy Step Code***, or how it is implemented.

The ESCC does not have any formal regulatory or administrative authority, however, it provides a venue for stakeholders to gather and share information, and work collaboratively to resolve issues as they arise. The ESCC provides the Province with an opportunity to monitor and track implementation of the ***BC Energy Step Code***, which could inform future changes to the energy-efficiency requirements in the ***BC Building Code***.

The role of the ESCC is to:

- Share information and support the Province with the implementation of the ***BC Energy Step Code*** in line with the ***Provincial Policy***.
- Advise and make recommendations on technical aspects of the ***BC Energy Step Code***.
- Provide input to the Province and local governments on policy and regulation related to the ***BC Energy Step Code***.
- Identify industry, local government, and provincial needs for successful adoption of the ***BC Energy Step Code***.
- Monitor adoption of the ***BC Energy Step Code***.
- Coordinate and direct research, communication, and training related to the ***BC Energy Step Code***.



The ESCC is comprised of associations representing industry professions and trades, local government and public sector organizations, and utilities and consumer interests (see logos of Energy Step Code Council members on page 2 of this Guide). Representatives of three departments at the Province of British Columbia provide guidance.

The ESCC is committed to building consensus between stakeholders. Consensus does not require unanimous agreement, but it does require working together, as a group, to make decisions based on the strongest areas of agreement. The new standard will have a greater chance of success if local governments implement it thoughtfully, with due care to appropriate incentives, industry capacity, affordability, and market conditions. This Guide provides tools and advice to achieve these outcomes.

2 How the BC Energy Step Code Works

2.1 Relation to the BC Building Code

Local governments can choose to require or incentivize builders to meet one or more steps of the ***BC Energy Step Code***, as an alternative to the compliance paths set out in the base ***BC Building Code***. For local governments, the ***BC Energy Step Code*** offers greater assurance that new buildings are designed for energy efficiency and are constructed as designed. Meanwhile, builders have a consistent set of performance standards throughout the province and flexibility in how they achieve the higher standards.

The ***BC Building Code*** separates all buildings into two basic categories – Part 9 and Part 3. The requirements of the ***BC Energy Step Code*** are also defined according to these building types, so it is important to understand the difference between them. These categories will be used throughout this Guide.

What are "Part 9" and "Part 3" Buildings?

Photos: Top: Townhome in Township of Langley, photo by Quadra Homes.

Bottom: 10-storey residential building in Vancouver, photo by Derek Lepper Photography.

Part 9 – Houses and small buildings.

These buildings are three storeys or less and have a building area or "footprint" no more than 600 square metres (approximately 6,500 square feet). This category includes single-family homes, duplexes, townhomes, small apartment buildings, and small stores, offices, and industrial shops.

Part 3 – Large and complex buildings.

These buildings are four storeys and taller and greater than 600 square metres in building area or "footprint". This category includes larger apartment buildings, condos, shopping malls, office buildings, hospitals, care facilities, schools, churches, theatres, and restaurants.

These definitions are simplified for the purpose of understanding the content of this guide. The official definition of Part 9 and Part 3 buildings can be found in the ***BC Building Code.***

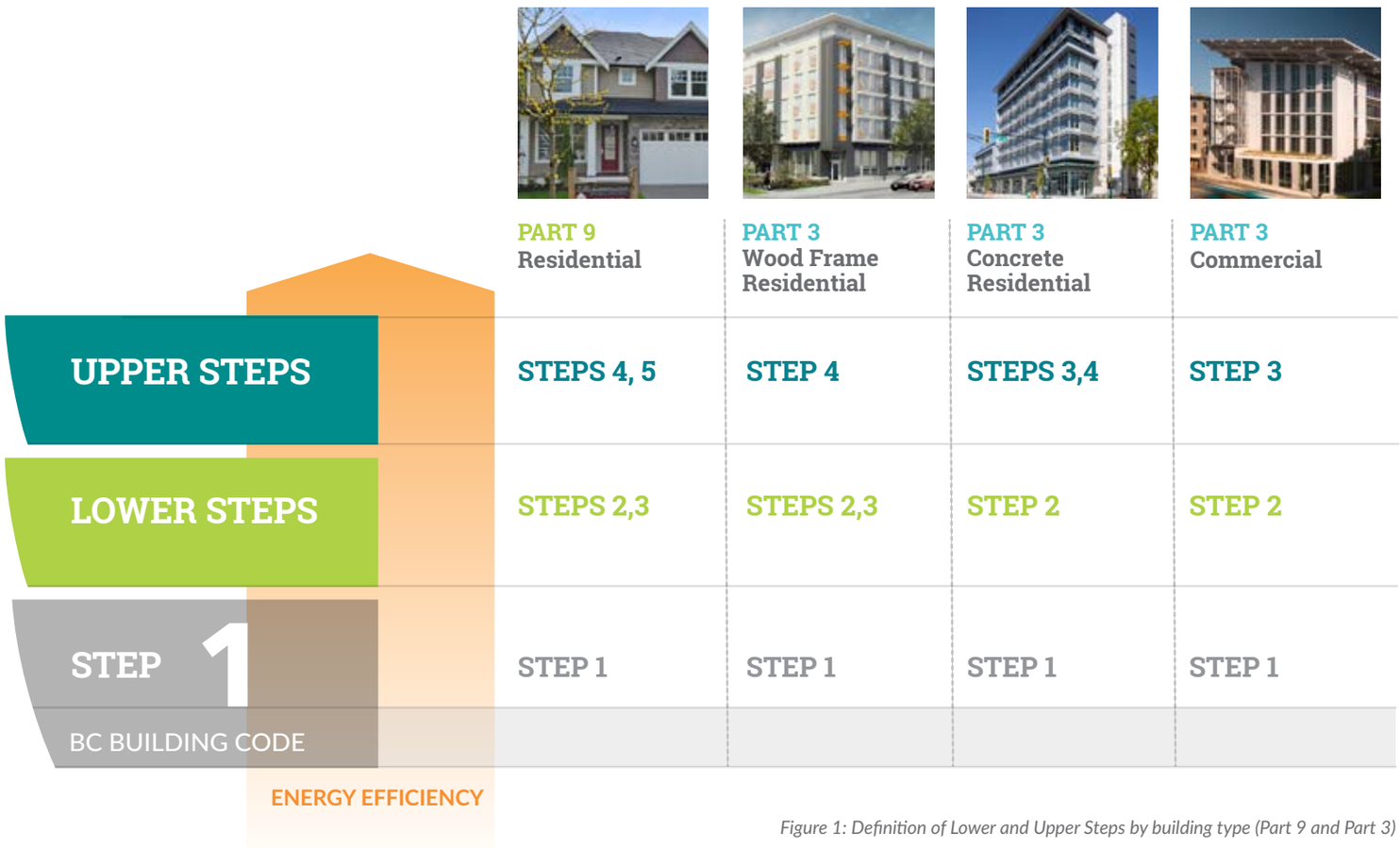


Figure 1: Definition of Lower and Upper Steps by building type (Part 9 and Part 3)

2.2 How Many Steps Are There?

The steps are categorized into Lower and Upper Steps according to building types (see Figure 1). To achieve Step 1, builders need to use a whole-building energy model to calculate the energy use of the building and conduct an airtightness test, but the performance of the building only needs to be as good as the base *BC Building Code* requirements for energy efficiency. The purpose of **Step 1 is to familiarize builders with a new way of measuring energy efficiency** although the actual construction of the building remains the same as conventional construction.

To achieve the Lower Steps, building and design professionals and trades can rely on conventional building designs with careful air-sealing practices, and incrementally incorporate some key elements in the design, building envelope, and equipment and systems. Builders and designers are advised to collaborate with the energy modeller to select the most cost effective way to meet the requirements. These Lower Steps give builders new flexibility in how to achieve modest gains in efficiency – through improved envelopes and/or upgraded systems.

To achieve the Upper Steps, builders and designers will need to adopt a more integrated approach to building design and may need to incorporate more substantial changes in building design, layout, framing techniques, system selection, and materials. These techniques and materials will be more costly and challenging without additional training and experience.

2.3 Transition Period

The ***Provincial Policy*** states that there will be a transition period of at least three years (2017–2020), during which time the Energy Step Code Council and member organizations will provide preliminary support to communities as they learn to apply the regulation. This policy also states that local governments should only adopt the Upper Steps in specific circumstances and in conjunction with appropriate incentives during the transition period (more details are provided in section 4.3).

2.4 Geographic Application

Currently, the ***BC Energy Step Code*** applies to all climate zones across BC for Part 9 buildings, and only to Climate Zone 4 (Lower Mainland and South Vancouver Island) for Part 3 buildings. In the future, the Energy Step Code Council will work with stakeholders and experts to develop proposals for Part 3 buildings in other climate zones. (see Figure 2)

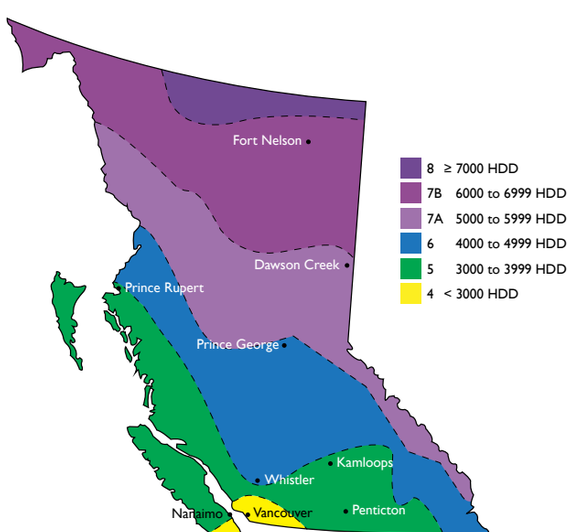


Figure 2: Map of BC Climate Zones. The BC Energy Step Code for Large and Complex Buildings (Part 3) is only available in Climate Zone 4.

2.5 Technical Requirements

The ***BC Energy Step Code*** establishes requirements for **whole-building energy modelling**, including modelling the performance of building envelopes and equipment and heating systems. The energy model must demonstrate how the building design will meet a set of requirements that represent increasing levels of energy efficiency. Once constructed and before occupancy, the building must undergo **on-site airtightness testing** to ensure the building is constructed as designed and meets airtightness expectations.

A primer on each of these key elements is provided in section 5 of this Guide, to help local governments better understand the technical requirements of the ***BC Energy Step Code***. The actual performance metrics requirements are also summarized in the tables in Appendix A for different climate zones and different building types. There are many resources available on **energystepcode.ca** that provide more in-depth guidance about building to meet the ***BC Energy Step Code*** requirements.

2.6 Considering Costs and Benefits

The ***BC Energy Step Code*** is at its core a market transformation tool; it aims to help to ensure that new buildings will be designed and built, from the ground up, to be as energy efficient as possible. **The most cost-effective time to invest in a building's energy efficiency is when it is first built.** Policy and regulation can help ensure that new buildings will be designed and built to be efficient.

However, communities are sensitive to any regulations that could impact builder costs in addition to those already incurred through fees such as development cost charges, and that potentially increase barriers to development. To better understand the financial implications of the ***BC Energy Step Code***, BC Housing has commissioned one of the most sophisticated high-performance building costing assessments ever developed in Canada. The study will show how the various steps may impact construction costs in various building types, and in different climate zones across the province. Though the research is underway – it is expected in late summer 2017 – some preliminary findings and insights have emerged, which we summarize here.

First, we characterize Step 1 as "enhanced compliance" – it involves demonstrating that a given building meets the existing energy-efficiency targets of the ***BC Building Code.*** For builders who have not previously used energy modelling to comply with the ***BC Building Code,*** or have not built to a standard that requires energy modelling, these initial projects may cost more. Generally:

For Part 9 buildings, engaging a registered Energy Advisor will cost a builder as little as $600 – though charges may be higher based on the needed level of engagement. However, that same builder may uncover cost savings from finding a more optimal way to meet code requirements, such as by reducing the size of a furnace or certain windows. Using an energy model provides builders with new flexibility that is not available in the base ***BC Building Code***, and this can provide the opportunity for cost savings.

For Part 3 buildings, energy modelling and airtightness testing are more complex and require a larger investment than for Part 9 buildings, but there is still an opportunity to reduce "red tape" because the ***BC Energy Step Code*** does not require certification or paperwork associated with many green building programs.

Second, buildings built to the Lower Steps of the ***BC Energy Step Code*** will incur slightly higher costs than those built to the prescriptive requirements of the ***BC Building Code*** (approximately 1–3% of construction cost, depending on building type and location in the province; note that this is different than the final cost, which also includes cost of land and other costs).

Finally, those built to Upper Steps will involve more of an investment in training and building components, and costs vary more widely than for Lower Steps. This is why local governments should not require Upper Steps community-wide for several years, and should instead be using incentives to encourage their construction. The Energy Step Code Council is also encouraging local and senior governments to demonstrate leadership by building public buildings to these Upper Steps.

Other findings from the BC Housing costing study include:

- It is generally easier and more cost-effective to achieve the steps in buildings that have simple forms and that share common walls, such as townhomes and apartments.
- Wood-frame multi-unit residential buildings will meet the standard more easily than similar concrete buildings. In fact, 4–6 storey wood-frame buildings built to the base ***BC Building Code*** are roughly equivalent to Step 2 for this building type.
- A building's form and orientation will have a significant impact on its performance. A simple design facing south will have an easier time meeting the steps than the same building facing north.
- It is generally easier for very large homes to meet the Upper Steps than for smaller homes, and it may be challenging for very small homes – such as coach houses and laneway homes – to meet the Upper Steps.
- In the province's colder northern regions, it may be challenging for homes to meet the Upper Steps altogether, without significant changes to building design.

Over time, as industry gains experience with these practices and energy-efficient products become more prevalent, cost discrepancies are likely to decrease. But the transition will not happen overnight.

To help support the industry through the transition to net-zero energy ready construction, BC Housing is developing ***An Illustrated Guide on Cost Effective Tips and Optimization for High-Performance Homes and Buildings***, and will host related training webinars. Find links to the costing study, and these other resources, as they become available, at energystepcode.ca.

Benefits of the BC Energy Step Code

Buildings built to higher energy efficiency standards also provide multiple benefits – to home and building owners and occupants, to industry, and to the community.

Occupants often prefer these buildings as they:

- Better manage temperature, improving comfort.
- Better manage fresh air throughout the building, improving health.
- Better manage soundproofing, reducing exterior noise.
- Require less energy, reducing utility bills.

Industry will be able to appreciate a new level of consistency in the market and predictability throughout the province as we move to net-zero energy ready by 2032. In this environment, construction industry practitioners, vendors, and manufacturers can invest in developing products, services, and best practices to deliver competitive services and products for high-performance buildings.

Together, the benefits to occupants and industry combine with a stronger green economy, which benefits communities across the province. It also helps the province and communities meet the goals and targets they have set to reduce our contributions to climate change.

"The BC Energy Step Code provides a consistent, performance-based approach to improving building energy efficiency. This clear path allows architects to continue to be at the forefront of designing structures that meet energy reduction goals. Architects are shapers of our built environment, and play a key role in not only implementing these types of sustainable initiatives, but leading them. The AIBC will continue to be a longtime partner and supporter of the BC Energy Step Code.

Mark Vernon, CEO, Architectural Institute of British Columbia

Photo: The Budzey Building - a partnership between BC Housing, the City of Vancouver, and RainCity Housing, provides supportive rental housing as part of the Provincial Homelessness Initiative. Vancouver, BC (Part 3, at least Step 3)

3 Applying the **BC Energy Step Code**: Policy Tools and Examples

In April 2017, the ***BC Energy Step Code*** became available to local governments to reference through bylaw and/or through policy to provide an incremental and consistent approach to achieving more energy-efficient buildings that go beyond the requirements of the base ***BC Building Code***. Local governments may begin enforcing these requirements as of December 15, 2017. To support energy conservation and greenhouse gas reduction objectives, Section 5 of the ***Building Act*** ("Unrestricted Matters") provides local governments the authority to reference the ***BC Energy Step Code***.

This section of the Guide provides hypothetical approaches that local governments may select to apply the ***BC Energy Step Code*** using a combination of tools appropriate for their circumstances – each demonstrating how to incrementally apply the Lower and Upper Steps. This is followed by a listing of policy tools that could be used by local governments to support, remove barriers, incentivize, or establish a requirement for specific step(s) across the community, by building type, by geographic area, and/or by approval mechanism (e.g., rezoning). Adjacent to the policy tools, related examples of programs in place in BC communities are provided to demonstrate how the tools can be employed to support increased energy efficiency in new buildings, demonstrating a variety of approaches suitable to individual communities.

3.1 Example BC Energy Step Code Approaches

The ***BC Energy Step Code***'s flexible framework allows each local government to select steps, policy mechanisms, scale, and types of incentives suitable to each community, ensuring sufficient local government capacity to administer the program and local industry capacity to meet the new standards. Figure 3 below shows three example approaches that could be taken to suit different communities. Guidance for selecting your community's approach is provided in Section 4.

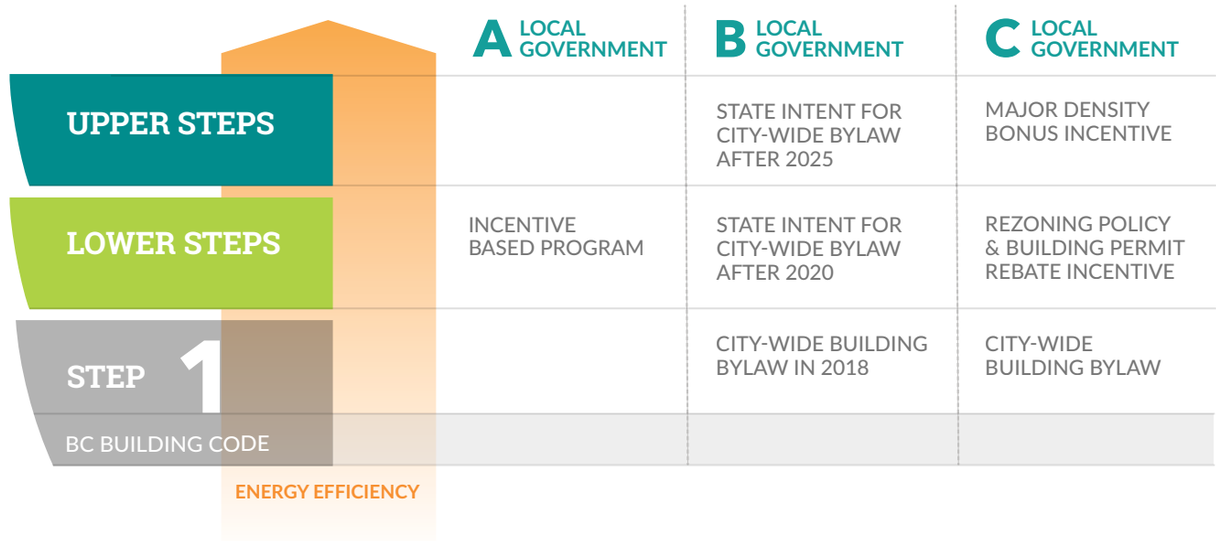


Figure 3: Three examples of BC Energy Step Code strategies for local governments

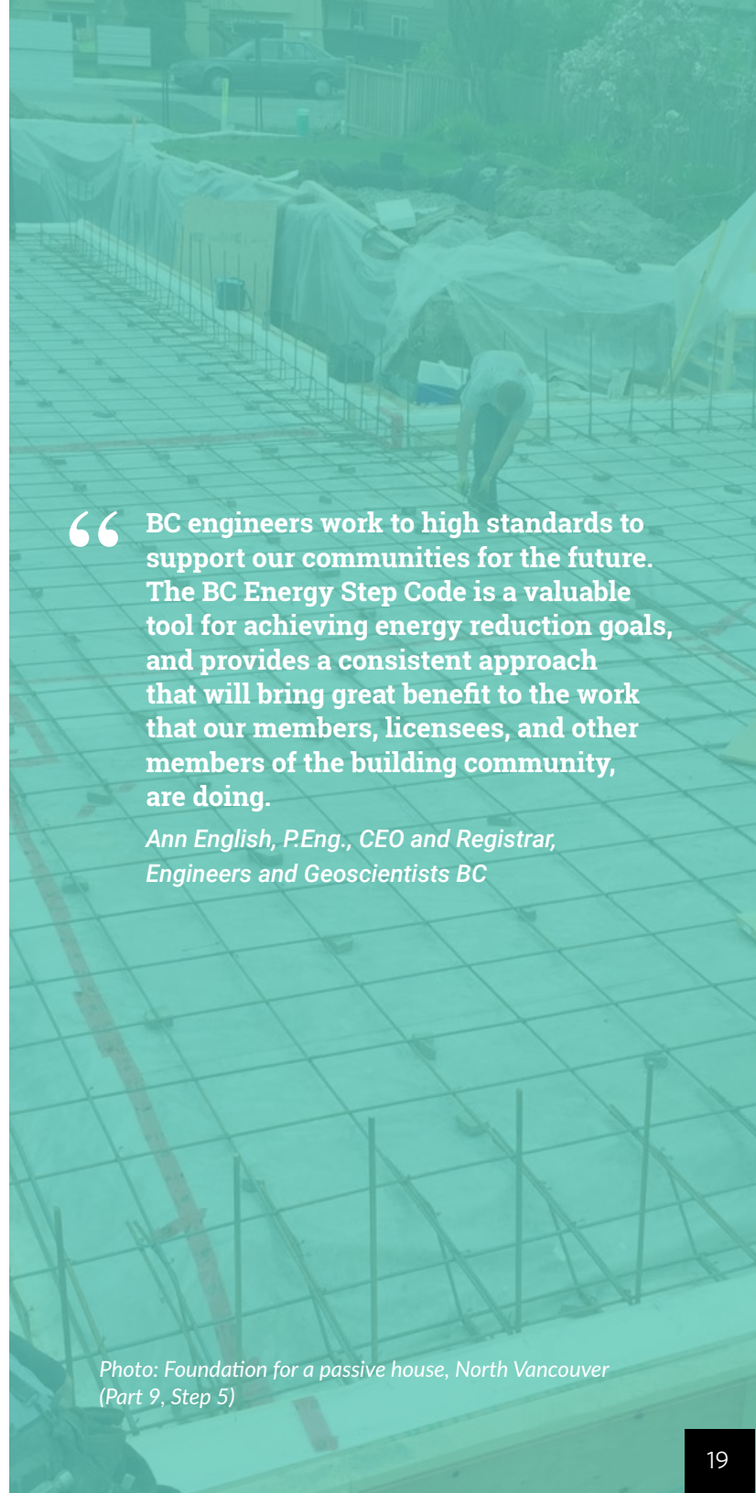
Local Government A may be new to requiring energy efficiency in buildings, in this example. Perhaps this government has reviewed local capacity, and has determined that capacity is insufficient to implement Upper Steps, but sees the value in preparing for future changes in the ***BC Building Code*** as the province moves towards net-zero energy ready buildings by 2032. This government may decide to begin with a cautious approach, offering a voluntary, incentive-based program. This government might achieve its objectives via an energy-advisor rebate program, building permit rebate, fast tracking of building permits, density bonus, or other voluntary incentives.

Local Government B may find through consultation with local industry that there is sufficient capacity to achieve Step 1 across the community, because there is familiarity with and expertise for energy modelling, airtightness testing, and meeting performance-based requirements. The local government may have previously provided an incentive program for these elements, supported capacity-building initiatives, or found industry has met these requirements in several existing buildings in the community to date. Also following consultation with industry, the local government may determine that, with appropriate capacity-building efforts and successful implementation of Step 1, they intend to require the Lower Steps for all buildings after three years. The local government may also decide to indicate the intent to require Upper Steps, if Lower Steps are successfully implemented, after 8–10 years of implementation. This provides a clear indication to industry how the local government is supporting the transition to net-zero energy ready buildings over the next decade or more.

Local Government C may understand through internal and external consultation that the community has more experience with high-performance buildings, and more industry and internal administrative capacity to deliver them. This local government may be ready to take a more ambitious, multi-faceted approach, building on previous programs that support energy-efficient buildings in the community. In this case the local government may adopt several steps as follows: Step 1 could be introduced in a jurisdiction-wide building bylaw, Step 3 could be a mandatory requirement for rezoning across the jurisdiction, and Upper Steps could be negotiated in select circumstances or locations. To encourage the highest level of energy efficiency that supports the community's sustainability, affordability, and health objectives, the government might also introduce a design competition. This local government would also likely provide an indication of timing for future requirements.

A Role for the Regional District

With respect to ***BC Energy Step Code***, regional districts may play two separate roles: first, the regional district may consider the applicability of adopting these higher building requirements where it administers and enforces the ***BC Building Code***, and second, the regional district may play a role in coordination and communication among all local governments in a region. Although each member municipality will determine an appropriate approach for its community, the regional district can keep members informed of activities, successes, challenges, and other important information to support successful incremental adoption of the new performance standards. **Where industry works across several municipal boundaries in a region, a regional district can host conversations to support coordinated or staggered implementation of requirements, taking into consideration capacity at a region-wide scale.**



> **"BC engineers work to high standards to support our communities for the future. The BC Energy Step Code is a valuable tool for achieving energy reduction goals, and provides a consistent approach that will bring great benefit to the work that our members, licensees, and other members of the building community, are doing.**
>
> *Ann English, P.Eng., CEO and Registrar, Engineers and Geoscientists BC*

Photo: Foundation for a passive house, North Vancouver (Part 9, Step 5)

3.2 Outline of Policy and Bylaw Tools

Several policy tools are available to local governments to reference the ***BC Energy Step Code***, as outlined in this section. Some of these tools provide **general awareness and policy support,** others are suitable for **providing incentives** to achieve specified steps, some may be used to **require targeted buildings** to achieve specified steps, and finally, others are important to review to **remove barriers** to achieving the requirements of the ***BC Energy Step Code***. Governments may also employ some tools to **demonstrate leadership** and support adoption of the ***BC Energy Step Code***. It is prudent to conduct a legal review prior to moving forward with one or more of these tools, particularly if you are considering the use of a tool that your local government has not employed previously.

Many tools have already been used in communities around the province to support energy efficiency in buildings. This section also provides examples demonstrating how the tools have been put into practice in BC communities, supporting a range of energy efficiency equivalent to Lower and Upper Steps.

How One Tool can be Employed to Achieve Various Outcomes

Several of the tools identified in this section may be applied in different manners with vastly different results. Depending on how it is implemented, one tool could be applied to simply encourage a few early adopters to conform to the identified steps, or to incentivize a moderate to substantial uptake of the identified steps. **It is up to each local government to work with community stakeholders to select the tool(s) that are most suitable for their circumstances.**

For example, a density bonus tool can be applied to obtain a range of results. A density bonus is a zoning tool that permits developers to build more floor space than would otherwise be allowed – thereby yielding more revenue from their project – in exchange for providing community amenities, which may include energy efficiency.

When the bonus floor space offered entails only a small increase in value over current allowance, the tool functions best as a voluntary encouragement for energy-efficient buildings among a minority of new buildings (e.g., 5%). However, when the bonus floor space offered amounts to a significant increase in value, then the result can be significant uptake, with the vast majority of new buildings opting to meet the higher energy efficiency standards (e.g., 95% or more).

When applying a density bonus tool to incentivize achieving a particular step, it is important that the density be "new" and be commensurate in value to the incremental investment being made in energy efficiency.[1]

1. For more information about best practices for community amenity contributions, refer to the Ministry of Community, Sport and Cultural Development guide Community Amenity Contributions: Balancing Community Planning, Public Benefits and Housing Affordability (http://www.cscd.gov.bc.ca/lgd/intergov_relations/library/CAC_Guide_Full.pdf).

> **The BC Energy Step Code presents a great opportunity for the building industry to help meet our provincial climate change goals through the design and construction of more energy-efficient buildings. We look forward to collaborating with local governments to ensure its pragmatic and orderly implementation.**
>
> *Bob de Wit, CEO, Greater Vancouver Home Builders' Association*

Photo: Clayton townhome development in Surrey BC, achieving ENERGY STAR for new homes, photo by Garcha Homes. (Part 9, Step 3)

A. Tools for general awareness and policy support

TOOL DESCRIPTION	BC ENERGY STEP CODE CONSIDERATIONS
The *Local Government Act* authorizes the development of **official community plans (OCPs)** to provide a vision for the community over a minimum 5-year time period. OCPs are significant because, after their adoption, all bylaws and works undertaken by a Council or Board must be consistent with the plan.	Include a policy statement about *BC Energy Step Code* to provide a **clear signal** to the community and industry that energy efficiency is important.
A **community energy and emissions plan (CEEP),** also sometimes called a **community energy plan** or **climate action plan,** provides a vision and sets a target for how a community will reduce its energy use and greenhouse gas emissions over time. It provides specific actions and implementation plans for achieving the target, and is useful to indicate the policy direction a community will take.	Include *BC Energy Step Code* as an action in the CEEP to provide a **clear signal** to the community about upcoming expectations with respect to new buildings.
A **neighbourhood plan** or **local area plan** sets out a strategy for the planning of a specific area within a local government and for a timescale as specified by the local government. The plan must consist of a written statement and map, which set out the local government's objectives for the plan area.	**Pilot a new energy efficiency policy in one geographic region** before expanding to cover the whole community.
Local governments may provide **tools** for building assessment and performance measurement and **learning forums** to connect industry with energy efficiency expertise, practitioners and products.	Provide learning forums and tools to **support market transformation** in your community.
A **sustainability checklist** is a non-regulatory tool used to encourage new development and buildings that support and advance community sustainability objectives. Local governments may require development applications include submission of a checklist as part of the approvals process.	Include the *BC Energy Step Code* on your sustainability checklist to **signal** that energy efficiency is important to the community and to **support voluntary uptake** of the *BC Energy Step Code*.

City of Surrey

West Clayton Neighbourhood Concept Plan

STEPS 1 TO 3, PART 9 & 3

The City developed a neighbourhood plan that includes a density bonus policy where additional density will be provided to new developments in exchange for achieving higher standards of energy efficiency. The objectives of the density bonus policy include the following:

- *To mitigate the emissions of greenhouse gases associated with the operation of buildings.*
- *To minimize the demand for electricity and natural gas in buildings.*
- *To reduce building operating costs for owners and occupants.*
- *To improve the comfort and indoor air quality of buildings.*

The additional density on offer varies by building size and type, as do the energy-efficiency requirements that must be met in exchange. For example, residential developments with buildings less than four storeys may obtain additional density between two and five units per acre, in exchange for having all buildings be certified to meet the ENERGY STAR® Canada standard (approximately Step 3). For buildings greater than or equal to four storeys, additional floor area will be provided in exchange for building compartmentalized suites, installing in-suite heat-recovery ventilators, undertaking building commissioning, and meeting airtightness standards.

Photos: Top: City of Surrey rendering of types of development possible in the West Clayton Neighbourhood Concept Plan, adjacent to an aerial photo showing the current land use.

Bottom: Participants providing input to a planning process through a planning process in Surrey.

B. Tools to provide incentives

TOOL DESCRIPTION	BC ENERGY STEP CODE CONSIDERATIONS
Greenstreaming, or "fast-tracking," is an incentive that local governments can offer developers to achieve energy efficiency (or other environmental objectives) in new developments.	• Fast-track ***BC Energy Step Code*** applications as a **valuable incentive** for Lower or Upper Steps (ensuring the wait times actually decrease for these applications). • Be sure to consider potential impacts on wait times for non-***BC Energy Step Code*** applications.
The **climate action revenue incentive program (CARIP)** provides a grant to BC Climate Action Charter signatories that meet a set of requirements—including a requirement to publicly report progress toward carbon neutrality in their operations. The grant is equivalent to 100% of the local government's direct expenditure on the carbon tax.	• Redirect CARIP grant to **fund a program that incentivizes compliance with the *BC Energy Step Code*** (e.g., to fund a building permit or Energy Advisor rebate program).
A **building permit rebate program**, or "feebate," is an incentive program that rebates a portion or all of a fee for achieving environmental objectives, including higher energy-efficiency standards in buildings.	• In most cases, provide **a modest incentive** to support uptake of the ***BC Energy Step Code***, particularly Lower Steps. • May be used with other benefits to incent Upper Steps. • Consider using the local government's CARIP grant to fund this program.
An **Energy Advisor rebate program** can be developed to subsidize engaging an Energy Advisor/modeller, encouraging residents and industry to adopt a performance-based approach to energy efficiency.	• Provide a **significant incentive** toward uptake of **Step 1**, supporting a market transformation and preparing industry for higher steps.
A **revitalization tax exemption (RTE)** is a tool for local governments to encourage various types of revitalization to achieve a range of social, economic, and environmental objectives by offering relief from property tax for a prescribed term. A revitalization program may apply to a small area(s), a certain type(s) of property, a particular activity or circumstance related to a property(ies), or an entire municipality. In 2007, the ***Community Charter*** [R545], which establishes authority to create RTE bylaws, was changed to make it easier for green development to apply for RTEs.	• Provide a **moderate to high level of incentive** to support uptake of the ***BC Energy Step Code***. • May be suitable to encourage Upper Steps in some circumstances.

City of Kimberley

Building Permit Rebates

STEP 2, PART 9 & 3

The City of Kimberley has offered builders an Energy Efficient Building Incentive Program since 2014 and recently updated it to align with the ***BC Energy Step Code***.

All new residential and commercial buildings in the city qualify for an initial rebate of $500 off the cost of a building permit, subject to the completion of a pre-construction EnerGuide evaluation report. This will offset the fees associated with an Energy Advisor to complete energy modelling.

Following project completion, an EnerGuide Energy Efficiency Evaluation report from a Registered Energy Advisor must be submitted showing either the final EnerGuide level for a new building or the pre-and post-project EnerGuide levels for renovations to existing buildings.

Further building permit rebates are available, scaled to align with the ***BC Energy Step Code***. A very high performing building (e.g., Step 5 equivalent performance) will generate a rebate of up to 80% of building permit fees. The City reports that the program has seen close to 90% enrollment so far in 2017, and it continues to push both builders and the municipality to keep the horizon of net-zero energy ready homes in focus. Kimberley believes that small communities will benefit from a reduced reliance upon energy as the costs for delivery, infrastructure, and maintenance are all higher in rural areas.

Township of Langley

Building Permit Rebates

ALL STEPS, PART 9

Since 2014, the Township has incentivized energy-efficient construction via a voluntary Green Building Rebate Program. The program offers builders reduced permit fees if they meet a range of performance targets, with the incentive funded by a minor sustainability fee levy applied to all building permits.

Participating builders have their plans evaluated by a Certified Energy Advisor through a subsidized cost – a service the Township funds as an educational and capacity-building component of the program. A building permit rebate of up to $750 is available for a single-family dwelling achieving EnerGuide 80 or above, while a rebate of $150 per unit is available for a multi-family dwelling achieving EnerGuide 82 or above.

In 2017, the Township amended the program to realign it with the revisions to the EnerGuide system, include and recognize other common industry ratings and programs, expand it to encourage energy-efficient upgrades or renovations to existing single-family dwellings, and introduce a multi-tiered rebate structure to allow for a more varied market uptake. In doing so, it has positioned the tiers to align with the various performance requirements of the ***BC Energy Step Code***.

Photos:
Top: *Energy efficient home in Langley that participated in the Township's program, photo from FM Construction.*

Bottom: *Energy efficient home in Kimberley that participated in the City's program, photo by Chris Pullen, Cranbrook Photo.*

C. Tools to provide incentives or mandate requirements

TOOL DESCRIPTION	BC ENERGY STEP CODE CONSIDERATIONS
Zoning bylaws define how specific areas of land can be used by implementing land-use policies set out in Official Community Plans and Regional Growth Strategies. A local government's core zoning authority is set out in the ***Local Government Act***, Section 479. A rezoning is a legal change to the zoning bylaw to permit an alternate type of development. Rezonings typically occur in response to objectives set out in an OCP or neighbourhood plan. Local governments have considerable influence and opportunity to encourage sustainable development through rezoning. A **rezoning policy** sets out objectives or criteria that the local government wishes to achieve in projects undergoing rezoning.	• When used as an incentive mechanism, identify opportunities to obtain "new" density (above and beyond that already available to the property) for achieving specific steps, where the increased value is at least commensurate with the incremental investment in energy efficiency. • See also density bonus and Phased Development Agreements.
A **density bonus** allows development at a level of density that surpasses the allowable FSR under the OCP or neighbourhpod plan in exchange for providing Community Amenities (which help a community meet its goals). These amenities typically include parks, heritage preservation, and affordable housing. One may also offer increased density in exchange for greener development as an amenity to the community. Density bonuses must be established in **zoning bylaws** that set out the specific conditions needed in order to receive the increased FSR.	• Can provide a **significant incentive**, and may be useful for either **Lower or Upper Steps**. • Especially effective where land values are high.
Section 516 of the ***Local Government Act*** permits local governments to enter into **phased development agreements (PDAs)**. These have the effect of protecting developments from subsequent zoning and development permit changes for a specified period of time. As PDAs replace zoning by way of bylaw for the term of the agreement, the process required to enter into such an agreement is consistent with that for a zoning bylaw.	• Negotiate a PDA requiring buildings reach specified steps (best applied for large sites). • Could be employed for **Lower or Upper Steps**, depending on the specific circumstances of the development. • May be particularly useful when a community is **introducing a new step** that has not been broadly met in the community to date.
Local governments are authorized to use **building bylaws** to regulate construction and to administer and enforce the ***BC Building Code***. Building bylaws are applicable across the community. Building bylaws may have sections applicable only to specific building types and/or geographic areas. Sentence 8 (3) (l) and Division 8 of the ***Community Charter*** govern this authority.	• Can **require compliance** with a **Lower Step** across the whole community during the transition period (as defined in section 2.2), where the community and industry have sufficient capacity. Or, the Building Bylaw may specify requirements by building type and/or by geographic region. • Following successful completion of the transition period, the Building Bylaw may be useful for applying **Upper Steps**; however, at this time it is most suitable for Lower Steps.

City of Richmond

Townhouse Rezoning Policy

STEP 3, PART 9

In 2014, the City of Richmond introduced a Townhouse Energy Efficiency and Renewable Energy Policy. Applicants seeking to build to a higher density by rezoning single-family lots for townhouse development are required to build to better-than-Building Code levels of energy efficiency. Under the City's policy, applicants choose from four options, including connecting to a district energy utility (DEU), installing on-site renewables to supply at least 51% of energy demand, building to the ENERGY STAR for New Homes standard or achieving an EnerGuide score of 82 or better (under the 1–100 scale) for every unit in the development. While the ENERGY STAR for New Homes Standard option approximates the level of performance required for Step 3, most applicants have selected the EnerGuide 82 option for new townhouse units, delivering a performance equivalent to Step 2 of the ***BC Energy Step Code***.

City of North Vancouver

Moodyville Pre-Zoning

STEPS 4-5, PART 9 & PART 3

In May 2016, the City of North Vancouver approved an extensive rezoning that aims to quadruple the population of the city's Moodyville District – a neighborhood adjacent to the city's industrial waterfront, and to the east of the popular Lower Lonsdale district.

As part of the Moodyville area redevelopment initiative guidelines, the City has provided a Density Bonusing mechanism in the zoning bylaw to allow developers to increase their buildable floor area ratio by as much as 320% if they meet an Upper Step performance requirement equivalency (equivalent to ***BC Energy Step Code*** 4 or 5). This is approximately a net-zero energy or Passive House level of performance.

The City has a long history of working with the local development industry to increase energy efficiency of new buildings, and this advanced program builds on this history to further increase the levels of energy efficiency achieved in specific new buildings. North Vancouver is leading the way for other communities that may follow – demonstrating how to incrementally increase energy-efficiency requirements, and over time, gain sufficient local capacity to offer builders a significant increase in density in exchange for a significantly higher level of performance.

*Photos: **Top:** Moodyville area before redevelopment.*
***Bottom:** Rendering of the Moodyville area after it has undergone redevelopment, as depicted by the City of North Vancouver, illustration by Frank Ducote.*

D. Tools to remove barriers

TOOL DESCRIPTION	BC ENERGY STEP CODE CONSIDERATIONS
Local governments may adopt **design guidelines** and policies to achieve certain objectives with new developments, ranging from accessibility, to heritage preservation, to view protection, to landscaping, and many more.	• Review to ensure guidelines do not **unintentionally make Upper Steps more costly** or unachievable (e.g., by encouraging building forms that are inherently energy inefficient). • **Align** design guidelines with best practices in energy efficient design.
Floor Space Ratios (FSRs) are established in zoning bylaws and they dictate the total floor area permitted in buildings, based on the size of the subject properties. Often, FSR is calculated to the exterior perimeter of the building (including exterior walls). This can effectively penalize buildings for featuring more highly insulated walls—they will have less habitable floor area—unless energy-performance-related FSR exclusions are implemented.	• Adjust FSR calculation methodologies to **ensure thicker walls with more insulation are not penalized,** by basing calculations on the habitable floor area (inside exterior walls).
Local governments are authorized to use **building bylaws** to regulate construction and to administer and enforce the ***BC Building Code***. Building bylaws are applicable across the community. Building bylaws may have sections applicable only to specific building types and/or geographic areas. Sentence 8 (3) (l) and Division 8 of the ***Community Charter*** govern this authority.	• Review your Building Bylaw to **remove any procedures that unintentionally inhibit** the *BC Energy Step Code* (e.g., procedures for compliance with prescriptive requirements).

Resort Municipality of Whistler

Gross Floor Area Calculations

REMOVING BARRIERS

In 2012, the Resort Municipality of Whistler amended their Gross Floor Area definition to exclude any incremental exterior wall thickness beyond six inches from the calculation of gross floor area for detached and duplex dwellings. This change reduced a previous barrier to the construction of thicker more energy efficient wall assemblies (e.g., Passivhaus construction methods).

Photos: ***Top:*** *Spruce Grove passive house in Whistler, photo by Kristen McGaughey Photography (Part 9, Step 5)*

Bottom: *Thickness of a wall from a pre-fabricated panel built in Agassiz to Passive House standards, photo by Monte Paulsen (Part 9, Step 5).*

E. Tools to demonstrate leadership

TOOL DESCRIPTION	BC ENERGY STEP CODE CONSIDERATIONS
A **corporate policy** can be put into place to require all new civic buildings meet a particular standard that supports a corporate or community objective.	• Include **requirements in tenders** for new facilities to achieve the Upper Steps. • Help **transform the local market** by providing valuable experience with meeting ***BC Energy Step Code***.
Local governments may have opportunities to encourage other **public sector buildings** to achieve particular standards for new buildings in their community boundaries.	• Identify performance standards for institutional buildings in policy (e.g., OCP, Local Area Plan). • Encourage applicable provincial or federal agencies to voluntarily adopt ***BC Energy Step Code*** standards or equivalent. • Where additional density is proposed (particularly residential density), incorporate ***BC Energy Step Code*** requirements in the rezoning process.
Provision of local government-owned land for re-development to meet OCP or neighbourhood plan objectives that are not likely to be achieved without support from the local government (for example, if the land requires remediation and renewal, or there is a desire for mixed-use development, social housing, energy efficiency, renewable energy, or other features that may be cost-prohibitive in the existing market). The price for the land can be set at a rate that is financially viable for both the local government and for the developer undertaking the project, while conforming to requirements of the Community Charter and Local Government Act.	• Include **requirements** in development approval for buildings to achieve the Upper Steps. • Help **transform the local market** by providing valuable experience with meeting ***BC Energy Step Code***.

Regional District of East Kootenay

Regional collaboration to advance energy efficiency

PART 9, ALL STEPS

Since 2013, the Regional District of East Kootenay has supported, together with the Columbia Basin Trust and BC Hydro, a community energy management program that supports all municipalities in the region in achieving energy efficiency and GHG emission reduction goals. By taking a collaborative, region-wide approach, smaller municipalities in the region have been able to undertake an array of successful initiatives, including:

- Facilitating the East Kootenay Energy Diet for home retrofits
- Hosting builder workshops to introduce performance-based compliance approach and techniques for improving and measuring energy efficiency
- Developing supporting policies for energy-efficient buildings, including a voluntary incentive policy to encourage performance pathway for building code compliance and an incremental building permit rebate aligned with Step 2-5 of the ***BC Energy Step Code***
- Development of 'Building a Legacy' a year-long engagement initiative to educate and train builders, trades, realtors, consumers and local government staff and elected officials
- Construction of a set of mobile wall assembly units, suitable for hands-on training for all stakeholders as part of 'Building a Legacy'

Within the Regional District, the City of Kimberley and District of Sparwood have been early adopters of the supporting policies for enhanced compliance and Step 2-5 rebate structures. Builders from across the East Kootenay have engaged in training, with over 40 builders gaining Energy Star certification in 2016. Further to coordinating all of these initiatives, the regional community energy manager also supports each local government staff and council through responses to inquiries, research and regular communication.

*Photos: **Left:** Thermal image being taken during a builders' workshop in Fernie; the home is designed to achieve at least Part 9, Step 3.*

***Right:** Blower door testing during a builders' workshop held in Invermere; the home is expected to exceed EnerGuide84 (equivalent to Part 9, Step 3).*

4 Developing Your BC Energy Step Code Strategy

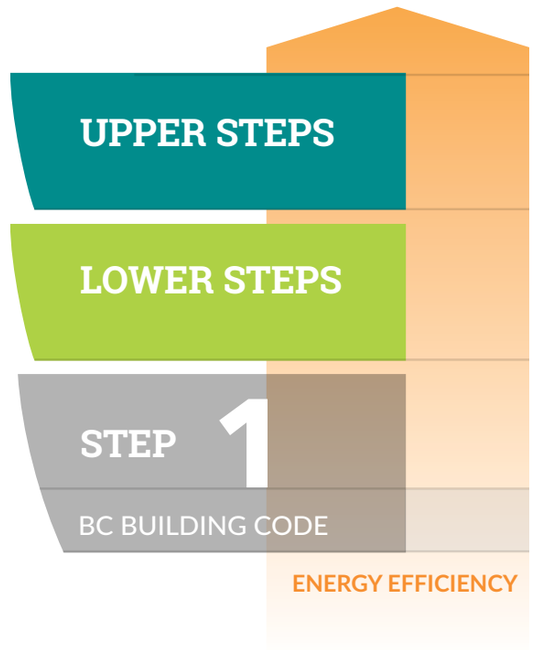
4.1 Key steps to develop your strategy

All local governments are encouraged to develop a comprehensive strategy when incentivizing or requiring one or more steps. Taking a strategic approach to the BC Energy Step Code will involve understanding the scope and opportunity provided by the legislation, as well as consulting with relevant stakeholders in your organization and community to identify and assess risks and opportunities.

These discussions will inform the approach that is most suitable to your community, and will give your local building community time to plan and prepare for the coming changes.

For the transition period – at least until 2020 – local governments that are considering the application of the BC Energy Step Code on a community-wide scale should only require the Lower Steps, except in specific circumstances where Upper Steps might be required when paired with appropriate benefits.

The following section outlines the key steps to defining an approach to the BC Energy Step Code suitable to your community. Each community will need to establish a specific process that fits its circumstances.



Consultation timelines when instituting new requirements:

It is important to provide industry and local government staff (planning department and Building Officials) with sufficient time to prepare for change. The following timelines are advised to provide sufficient notice for new requirements, from the time you notify the ESCC of your intent, to the time you launch and enforce the BC Energy Step Code:

Lower Steps: 6 months

Upper Steps: 12 months

Refer to the BC Energy Step Code web site (energystepcode.ca) for resources, updates, training publications, and webinars.

1 **Review** resources.

- Communications, awareness and training publications, and webinars available at: **energystepcode.ca**
- Contact BC Housing to help identify energy-efficient buildings and energy-efficiency expertise in your area
- Join a local government Peer Network to work together on effective ***Energy Step Code*** implementation. Contact BC Hydro for more information (sustainablecommunities@bchydro.com)

2 **Notify** the ESCC of intent to consult and reference the BC Energy Step Code.

Visit **energystepcode.ca** to obtain the form and instructions on how to notify the ESCC

3 **Consult, define** your program details **and prepare** policies and/or bylaws.

A. Conduct consultation

- Establish a process and determine who you need to engage and why (see 4.2)
- Develop clear timelines that meet the Provincial policy (see 4.3)
- Re-engage as needed, being sure to incorporate sufficient time should your approach change after consultation (see 3.2)

B. Consider appropriate tools

- Identify **tools** to reduce barriers, mandate changes, and/or demonstrate leadership in civic buildings

C. Review policies and processes

- Streamline affected development approvals
- Minimize the impact on building permit approval timelines (see 4.4)
- Harmonize with district or alternative energy policies (see 4.5)

D. Identify communications and awareness needs

- Which staff, elected officials and advisory members need training?
- How can your local government support industry to connect with training resources?
- What local communication materials need to be updated or created?

E. Adopt policies and bylaws, based on consultation outcomes

F. Identify clear timeframes and indicate future intentions (see 4.6)

G. Identify how to monitor your program's success (see 4.7)

H. Identify opportunities to demonstrate leadership

- Local government corporate policies and tenders (see 4.8)

4 **Notify** the ESCC once plan is approved and ready.

5 **Launch** and administer the BC Energy Step Code as defined for your community.

4.2 Consultation: Who to Engage and Why

Engaging with the appropriate stakeholders while defining your strategy will shape an approach that is suitable to your local building culture. The level of engagement needed will vary by community and by the type and extent of the proposed new policy, program, or bylaw.

Conducting meaningful engagement with the stakeholders identified not only helps you develop a suitable approach, it helps raise awareness and prepare industry for changes that will be coming in your community and across the province.

An overview of important stakeholders, and their role in strategy development and implementation includes:

- **Staff**: Planning, development, and building compliance staff will help define the strategy. Staff can identify potential alignments or conflicts with existing policies, processes, and bylaws, and identify preferred policy tools. Staff can also identify opportunities for communicating about the *BC Energy Step Code* with the community – through front-desk inquiries, at pre-application meetings, during building permit application, and others.
- **Elected officials and approval bodies**: Elected officials need to understand the *BC Energy Step Code*'s purpose and objectives, be briefed on the outcomes of the consultation process, provide support for the program, and communicate the community's approach and priorities with respect to energy efficiency and the *BC Energy Step Code*. Approval bodies, including design review panels and planning commissions, will need to understand the purpose and objectives, and how increasing energy efficiency may change the form and design of new buildings.
- **Industry**: Representatives from the appropriate building sector (Part 3, Part 9, or both – including designers, builders, energy professionals, trades, and suppliers) will be key participants in identifying the types of policy tools and incentives that are appropriate for the steps being proposed, and identifying potential conflicts with existing policies, processes, and bylaws that need to be addressed. As a best practice, local governments may also consider using forums to facilitate connections among Energy Advisors, builders, designers, construction companies, and suppliers.
- **Neighbouring local governments**: Many industry professionals and trades work across several municipalities, so an important aspect of understanding how available industry is to deliver services in your community is knowing what demand there may be for these services in the region. Neighbouring communities can provide information on type and scale of programs being put in place, and may be interested in aligning programs to enhance regional consistency.
- **Public**: Public engagement helps share messages, gauge support for new objectives, and gather input during strategy development. The public should be introduced to alternative building designs that may appear more frequently, and the benefits of energy-efficient buildings.

Ideas and Resources for Engaging Stakeholders

- The Energy Step Code Council is pleased to make a Microsoft PowerPoint™ presentation available, upon request, to local government staff and elected officials. The presentation is a primer on the standard, explaining how it came to be, how it works, and how local governments are already requiring or incentivizing high-performance buildings. Request a copy of this presentation to use in your community through the "contact" section of energystepcode.ca.
- Host an “all parties” forum to bring together your building officials and planners, designers, Energy Advisors, builders, trades, and suppliers to ensure that everyone that will deal with proposed new BC Energy Step Code provisions is on the same page and has the same interpretation of the new requirements.
- Collaborate with local networks, industry associations, and schools to distribute primers and notices about workshops.
- Have building officials attending site visits alert the builder of the upcoming changes, providing handout materials and other communication materials.
- Create information boards or notices to post at City Hall, and at local building centres, plumbing suppliers, and other areas that interested parties may convene or frequent.

4.3 Provincial Policy: Timelines and Grace Periods

The ***Provincial Policy*** provides guidance for the successful implementation of the ***BC Energy Step Code***, based on input from the multi-stakeholder members of Energy Step Code Council. The following summarizes key guidelines from the ***Provincial Policy*** with respect to notifying the ESCC of your plans, providing sufficient time to industry to prepare for new requirements, and providing appropriate grace periods for applications in place prior to new requirements coming into force.

Notifying the Energy Step Code Council

It is important to **notify the Energy Step Code Council through the Building and Safety Standards Branch** at two (2) key points in your process:

1. When you plan to begin consultation with industry on your proposed approach.
2. When you have established or ratified a bylaw, policy, or program that references the ***BC Energy Step Code***.

To notify the ESSC of your intentions, complete the notification form available through the Building and Safety Standards Branch, or by visiting energystepcode.ca. Keeping the ESCC informed ensures you have access to the most recent information and resources available, and it allows the ESCC to track and monitor the ***BC Energy Step Code*** implementation province-wide.

Minimum Timelines for Requiring the BC Energy Step Code

It is also important to **provide industry and local government staff** (planning department and building officials) **with sufficient time to prepare for change**. The ***Provincial Policy*** establishes minimum timelines for implementing new requirements, beginning when your local government gives notice to the Energy Step Code Council that you are initiating consultation with industry on a proposed approach, and ending at the time the new requirement comes into force.

These timelines are summarized as follows:

- ***Lower Steps:*** New or expanded requirements for Lower Steps may be enforced no sooner than six months after notification.
- ***Upper Steps:*** New or expanded requirements for Upper Steps may be enforced no sooner than one year after notification.
- **Transitioning existing programs** implementing equivalent steps:[1] Communities may transfer existing programs to ***BC Energy Step Code*** equivalents without delay. Expanding the application of an existing program requires three months notice.

Local governments may adjust these timelines in consultation with local industry and may obtain guidance from the Energy Step Code Council. If a local government chooses to adopt a higher step than was put out during consultation, or plans to change an existing program by broadening the scope, increasing step level, or changing the approach, then the minimum notification timeline should be reset. Requirements may not come into force until December 15, 2017 – though local governments may adopt bylaws in advance of this date.

Grace Period for In-Stream Applicants

At the time a local government enacts the ***BC Energy Step Code***, applicants that have previously initiated an application for a new building(s) – rezoning, development permit, development variance permit, or building permit – with detailed design drawings, are considered "in-stream" and should be permitted to build to the energy standards in place at the time of application, as long as they have submitted an application for a full building permit application within one year.

Planners will need to incorporate the new ***BC Energy Step Code*** provisions into discussions as early as possible when discussing complex applications that are not ready for development application submittal prior to enforcement of the ***BC Energy Step Code***.

*1. After December 15, 2017, existing programs with technical building requirements in bylaw will no longer be enforceable and need to be redefined for equivalence to the **BC Energy Step Code**. Communities that are transferring existing energy-efficiency policies or programs to their **BC Energy Step Code** equivalents may do so without delay. See Appendix B for for an equivalency table.*

"The BC Energy Step Code offers the development industry a more flexible, performance-based rather than prescriptive, approach to meeting the energy-efficiency standards of the BC Building Code. We are moving from having inconsistent standards across BC to a new, coordinated benchmark, aligned with future net-zero provincial requirements. The Urban Development Institute is proud to have been at the table since day one, intends to remain involved and is supportive of the Best Practices Guide.

Anne McMullin, President/CEO, Urban Development Institute

Photo: Participants providing input to a planning process through an energy charrette in Surrey.

The BC Energy Step Code training webinars for building officials are valuable resources (available at energystepcode.ca).

4.4 Changes for Building Officials, Permits, and Inspections

The *BC Energy Step Code* represents a significant change to how buildings demonstrate compliance with energy-efficiency requirements, and local governments administering and enforcing the *BC Energy Step Code* **may need to establish new procedures for determining compliance**. Some local governments may already be incorporating these changes in order to accommodate performance-based compliance under the base *BC Building Code.* Where this approach is new, new procedures may be needed for accepting energy models and for airtightness testing, as described below.

Under the *BC Energy Step Code*, each building will require an energy model, and the model must demonstrate the building is designed to meet the requirements set out for the specified step (see Appendix A for the list of requirements). New procedures may include evaluating whether the documentation is complete and meets the standards for energy models that are set out in the regulation.

For Part 9 buildings, energy models will typically be prepared by Registered Energy Advisors retained by the builder or designer. Part 9 energy models will be prepared using software, such as HOT2000, which generates results according to the EnerGuide Rating System.

For Part 3 buildings, energy modelling is within the scope of Letters of Assurance, and the role of the building official does not change.

Inspections will no longer need to verify prescriptive requirements (for example, there are no minimum or maximum requirements for insulation, door/window/skylight U-values, or equipment efficiency in the *BC Energy Step Code*). Instead, the requirements for components are dictated by the energy model submitted with the permit application.

To prepare for these changes, local governments may wish to:

- **Have building officials complete** the *BC Energy Step Code* training webinars for building officials (available at energystepcode.ca).
- ***Review*** and update compliance procedures to accommodate the change in approach.
- ***Review*** best practices in energy modelling (see resources noted in section 5).
- ***Develop*** a policy that clearly defines the "due diligence" requirements for your local government.
- ***Stipulate requirements*** related to documentation of final compliance (other than those required for Part 3 buildings in the *BC Building Code*) to verify the energy model details are the same as the actual construction of the building.
- ***Obtain guidance*** from legal counsel on appropriate procedures for accepting assurances.
- ***Define procedures*** for completing airtightness testing.
- ***Establish*** the level of interaction needed with the Energy Advisor on site for the inspection.
- ***Identify*** procedures for what happens if a building fails to meet the airtightness requirements.
- ***For Part 9 buildings,*** check that air and vapour barrier products and materials conform to a standard listed in the *BC Building Code*.
- ***Check*** that the building has a ducted supply ventilation system (as the *BC Energy Step Code* does not permit the use of a passive ventilation system).

Alternative Solutions

Building to the *BC Energy Step Code* is likely to drive an increase in the use of alternative solutions. As builders are required to increase the airtightness of the building, and improve the building envelope, equipment, and systems, this may require design approaches, materials, and equipment that are not currently listed as acceptable solutions in the *BC Building Code*. The *BC Building Code* does allow for alternative solutions to be proposed to the Authority Having Jurisdiction, but processing these requests can be time consuming, complex, and expensive. Local governments should anticipate this increase in alternative solution requests and have a process in place to process them efficiently. This will be more of an issue in Upper Steps where building performance is being pushed well beyond conventional practices.

4.5 Harmonizing with Existing Policies and Priorities

Local governments are well accustomed to balancing across multiple objectives. Two examples of relevance to successfully implementing the *BC Energy Step Code* are discussed below: strategies to maintain affordability and considerations for district energy and/or alternative energy policies.

A Strategy for Energy-Efficient and Affordable Housing

During the development of the *BC Energy Step Code*, the Energy Step Code Council placed much care and attention on identifying an incremental series of energy-efficient building standards that may be suitable in different regions or circumstances. Some of these standards are achievable today in a cost-effective manner, while others require new capacity, training, or higher initial costs. Because each community in BC faces different contexts with respect to capacity, cost of building, affordability, housing supply, and land market conditions, each local government will need to consider which tools and approaches are most suitable in their communities. This is why there are multiple steps, so that each local

government can introduce energy efficiency in a step-wise manner that works for the community.

Consider the following tips to help minimize impacts on affordability as you develop your ***BC Energy Step Code*** strategy:

- ***Familiarize*** yourself with the incremental costs of achieving the steps for different building types and climate zones by reviewing the results of BC Housing's costing study (discussed in section 2.6).
- ***Review*** BC Housing's ***An Illustrated Guide on Cost-Effective Tips and Optimization for High-Performance Homes and Buildings*** (available fall of 2017 at energystepcode.ca).
- ***Check energystepcode.ca*** for links to information about provincial or utility incentives and financial mechanisms that may be available to industry.
- ***Review*** the tools in section 3.2 and consult with local industry and real estate to determine a suitable level of incentive for your community.
- ***Support*** industry learning through builder forums, linking to listings of energy modellers and airtightness testers, promoting training events, etc.
- ***Ensure*** design guidelines align with cost-effective and energy-efficient building forms.
- ***Exclude*** additional wall thickness related to increased insulation from floor space ratio (FSR) calculations.
- ***Start with Lower Steps*** because these can use conventional materials and approaches.
- ***Consider Lower Steps*** for very small single-family homes and coach houses, since the Upper Steps are more difficult to attain for very small buildings.
- ***Ensure*** that new regulations and permitting processes do not negatively impact approval timelines.
- ***Provide a clear direction*** for the future so industry can prepare for upcoming changes to local building requirements.

More energy-efficient homes are likely to experience reduced energy costs and lower maintenance expenses, which can help improve affordability for home occupants.

District Energy, On-Site Renewable Energy, and BC Energy Step Code – Friends or Foes?

Encouraging renewable district energy systems and on-site renewable energy generation are two actions that BC local governments have pursued in support of their climate action goals. Some communities have developed renewable district energy systems that require certain adjacent buildings to connect to the system, while other communities have encouraged or required a certain amount of on-site renewable energy generation be installed. Meeting these requirements can involve increased capital investment beyond that required to meet the base ***BC Building Code***.

The ***BC Energy Step Code*** focuses on making buildings need less energy, regardless of the source of energy, which can also involve increased capital investment (especially for the Upper Steps). Since highly energy-efficient buildings have much lower heat demand, it may be challenging to maintain a financially viable renewable district energy system that serves very efficient buildings. Moreover, requiring investments in both the energy supply and demand may involve higher costs.

Local governments need to consider these policies in tandem. Where a building is required to connect to a renewable district energy system, the local government should carefully review the implications before setting ***BC Energy Step Code*** requirements (through research and discussion with the district energy provider), in particular in relation to meeting Upper Steps. Looking forward, it is important that new renewable district energy systems incorporate the shift towards net-zero energy ready buildings as the minimum requirement in the BC Building Code by 2032 into financial projections and feasibility studies.

For some building designs, Upper Steps of the ***BC Energy Step Code*** requirements may be challenging to meet (e.g., a south-facing building designed with a high ratio of glass). In these cases, developers may offer to invest in on-site renewable

“By incentivizing and requiring energy-efficient new construction, the BC Energy Step Code will help drive market demand for a range of high-performance building products including mineral-fibre insulation. The regulation stands to stimulate this manufacturing sector, allowing BC companies to meet the growing demand with a wider range of more competitive products and assemblies. This will attract investment, spur innovation, and create new opportunities and skilled jobs in Canada's clean-growth economy.

Jay Nordenstrom, Executive Director, NAIMA Canada

Photo: Bullit Center in Seattle, Washington, a high-rise commercial concrete building. Photo by Nic Lehoux.

energy as an alternative to reaching higher energy efficiency standards. It is important for local governments to develop policies that are flexible to accommodate these types of cases.

4.6 A Clear Direction for the Future

Each community will need time to develop and transform their local energy-efficient building market. For many communities, adapting to performance-based compliance will call for a significant outlay of effort, and will consume the first few years of implementing the ***BC Energy Step Code***. For communities with established energy-efficiency policies, transitions may be much easier.

Depending on your community's objectives, there may be a desire to reach for Upper Steps over the longer term in advance of future ***BC Building Code*** updates. To sufficiently prepare industry and the community, it will be beneficial to indicate a schedule of increased ***BC Energy Step Code*** performance that your community may require over the coming years. It will also be helpful if a few early adopters are provided significant incentives to achieve Upper Steps in specific locations – demonstrating what is feasible in the community. Figure 4 outlines two example strategies to increase energy requirements over time (assuming a 3-year transition period).

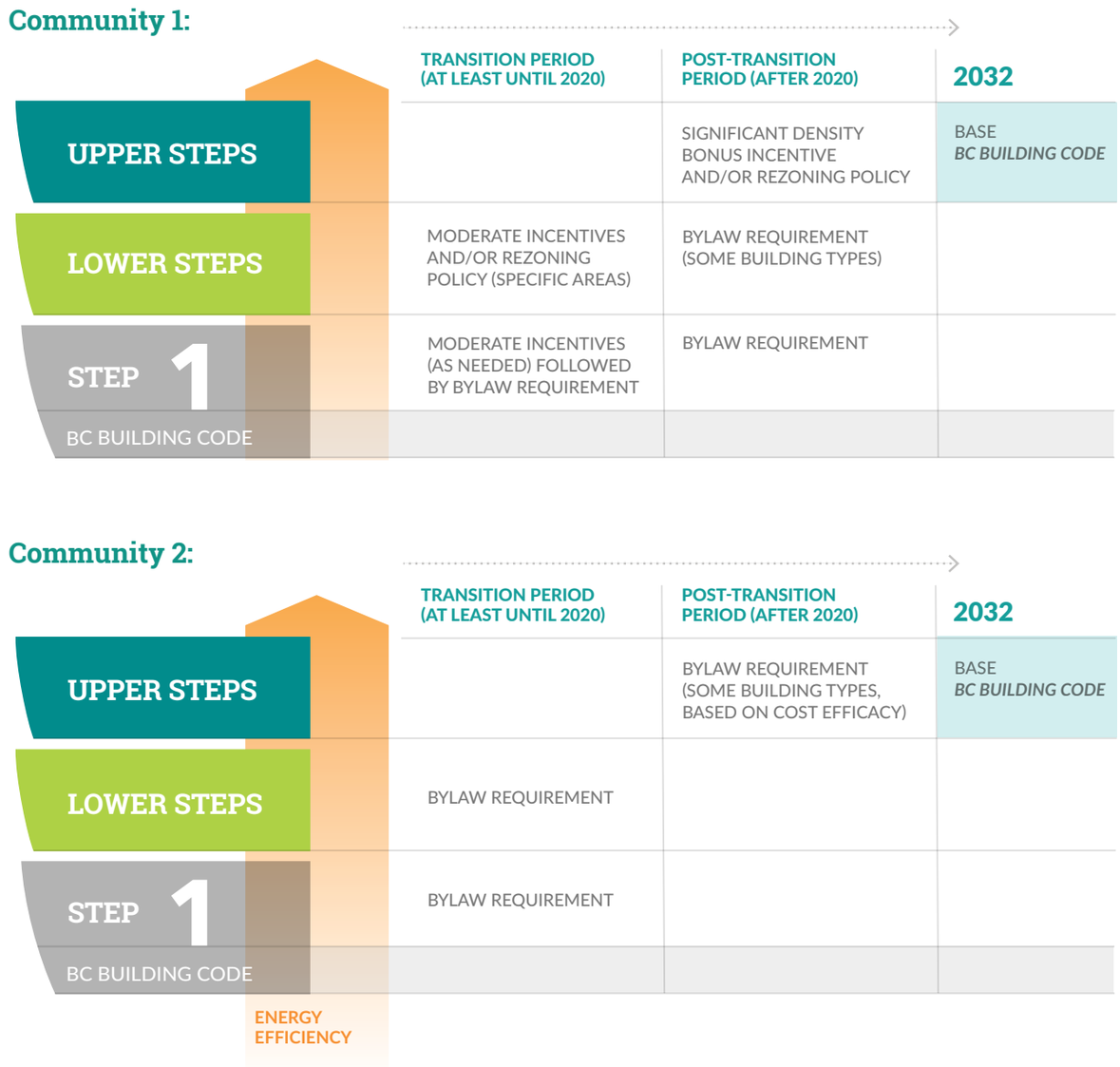


Figure 4: Two example paths for adopting increasing steps over time

4.7 Monitoring, Evaluating, and Adjusting

Once you have developed your strategy, it will be important to monitor progress to see if you are reaching your community's objectives with respect to the ***BC Energy Step Code***. An annual assessment of progress will provide you with critical information that may lead you to either make adjustments to your strategy, or to keep a steady course. Monitoring and evaluation will also indicate the appropriate time to increase performance requirements.

Here are some factors to consider tracking to support your program evaluation:

- Industry and local governments find the steps clear.
- Steps are reported to enhance consistency in development industry.
- Anticipated costs (including time) and benefits are realized.
- There is good awareness and education across industry.
- Continuous learning is happening in industry and at the local government.
- Processing times have not slowed down.
- The number of development applications and building permit values have not gone down.
- Economic opportunities are realized.

As numerous staff will be responsible for implementing various elements of the strategy, defining a clear monitoring and evaluation process during the strategy, including required data needs, will help ensure evaluations are based on accurate quantitative and qualitative data, and that this information is regularly collected and tracked.

To support a smooth transition toward net-zero energy ready buildings by 2032 across the province, the Energy Step Code Council will also be tracking key information about the uptake of the ***BC Energy Step Code*** in all communities. Be sure to provide the ESCC with monitoring and evaluation results from your community, as well as relay any pertinent case studies and lessons, to support the province-wide transition, by responding to ESCC surveys and requests for information (likely to be conducted annually).

4.8 Take Leadership in Civic Facilities

The Energy Step Code Council is encouraging local governments to consider specifying the Upper Steps as a tender requirement for new public amenities, such as a community centre or recreation complex.

In the past decade, a number of governments across Canada (local, provincial, and federal) have helped increase industry familiarity with high-performance building techniques and products by requiring high-performance building standards, through green-building rating and certification systems, as a condition of public tender. This is a proven way of using public sector leadership to help prepare the local market for broader uptake. The Province and BC Housing are taking steps towards leadership in new public sector buildings and affordable housing projects. Local governments can also work with provincial and federal agencies to encourage new institutional buildings to be built to the Upper Steps, further supporting market transformation toward high-performance buildings in the community.

> **"The BC Energy Step Code gives local governments a tool to consistently and clearly indicate what they want to accomplish on efficiency, and the authority to do it. The prescriptive approach in the building code is open to interpretation, and it doesn't really achieve the goal of what it is trying to do. The performance approach allows builders to be flexible and allows the builder and the designer to look for solutions that best fit the situation.**
>
> *Mark Bernhardt, a building contractor in Victoria, BC*

Photo: Spruce Grove passive house in Whistler, photo by Kristen McGaughey Photography (Part 9, Step 5)

5 A Primer on the Technical Requirements

5.1 Whole-Building Energy Modelling

To meet the requirements of a given step of the ***BC Energy Step Code***, a whole-building energy model of the proposed building design must be completed prior to construction to demonstrate to local government building officials that the building's modelled design meets or exceeds a set of defined requirements. Energy models are usually prepared by trained energy modellers, who work in collaboration with builders and/or designers to demonstrate how the energy-efficiency requirements will be met. This is already common practice for high-efficiency buildings in BC, and is an optional compliance path for meeting the energy-efficiency requirements in the base ***BC Building Code***.

After construction, the responsible party must prepare documentation that the building meets the specifications set out in the energy model. The responsible party varies depending on the building type:

Part 9 buildings: the owner is responsible for preparing the appropriate documentation. In practice, this responsibility is likely to be delegated to the designer, builder, or Energy Advisor.

Part 3 buildings: the qualified professional (architect or engineer) is responsible for preparing letters of assurance.[1]

To improve consistency, transparency, and comparability, the ***BC Energy Step Code*** uses the same metrics for each step, with progressively increasing performance requirements at each step (see Appendix A for a summary of these requirements). The metrics represent modelled energy use in relation to the building envelope and the equipment and systems.[2]

1. Letters of assurance, introduced in the 1992 BC Building Code, are uniform, mandatory documents intended to clearly identify the responsibilities of key professionals in a building project.

What is an Energy Model?

An energy model calculates how much energy a proposed building is expected to use. The energy consumption can relate to space heating, hot water heating, ventilation, lighting, appliances, and plug loads. The modelling is done by a trained energy modeller who understands modelling software, construction details, and code requirements. The energy model accounts for the size and geometry of the building, the climate location, the effective insulation values of assemblies such as walls, ceilings, and windows, and the mechanical systems that heat and ventilate the house. Standard operating conditions are assumed for the quantity and living habits of the occupants. The ***BC Building Code*** identifies acceptable modelling and airtightness tools and procedures (for acceptable procedures for Part 3 buildings refer to Part 8 of the National Energy Code of Canada (NECB) and City of Vancouver Energy Modelling Guidelines).[1] ***Professional Practice Guidelines – Whole Building Energy Modelling Services*** from Engineers and Geoscientists BC and AIBC will provide guidance for using energy models to comply with regulations, incentive or rating programs, and as a design tool in developing higher performing buildings.[2]

Who Prepares Energy Models?

For Part 9 buildings, an Energy Advisor can provide both energy modelling and airtightness testing—the two compliance services needed for Part 9 buildings. Registered Energy Advisors are third-party consultants who have been trained and licensed through their organization and Natural Resources Canada, and there are numerous registered in BC.[3] Since the availability of Registered Energy Advisors varies by region, it is important to ensure Part 9 builders have access to a Registered Energy Advisor when considering adopting the ***BC Energy Step Code*** program in their communities.

For Part 3 buildings, an architect, engineer, or trained energy modeller can provide energy modelling needed to achieve the steps, and numerous architectural and engineering consulting firms currently provide these services throughout BC. Many new commercial buildings currently use this approach and are already capable of achieving the Lower Steps.

1. http://vancouver.ca/files/cov/energy-modelling-guidelines-v1.0.pdf

2. The guidelines are expected by the end of 2017 and will be available at www.apeg.bc.ca and www.aibc.ca.

3. To obtain a list of Registered Energy Advisors, visit https://www.nrcan.gc.ca/energy/efficiency/housing/service-providers/15807. A Training Gap Analysis and Industry Capacity Assessment was conducted for the ESCC in 2017, and this estimated sufficient capacity to serve 60% of new Part 9 building in 2018 and 100% by 2020, with the roll-out of the ESCC training strategy.

5.2 The Building Envelope

The "building envelope" refers to the physical barrier separating a building's heated or cooled interior from the outside elements. It includes the walls, roof, floors, windows, skylights, and doors (see Figure 5). If the temperature inside a building is different than the outside, heat will naturally move through the envelope. If a lot of outdoor air seeps into the building, heating or cooling systems may kick in to bring the air to room temperature (especially if it is much colder or warmer outside compared to inside), and this can use a lot of energy. A high-quality building envelope manages the air that moves between indoors and outdoors, and reduces the requirements on a building's mechanical systems.

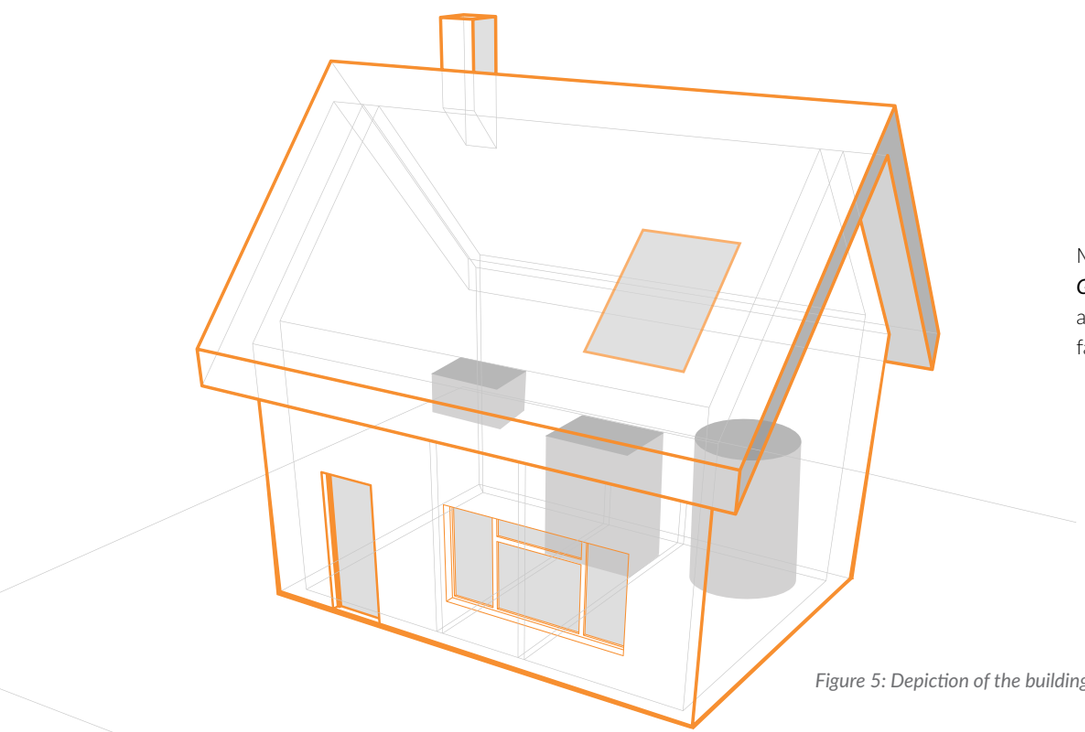


Figure 5: Depiction of the building envelope

The key elements of a high-performance building envelope include:

- **Insulation** that helps to slow the movement of energy through the walls and keeps the building at a comfortable temperature – warm during cold months and cool during warm months.
- **Windows, doors, and skylights** that are well positioned to make optimal use of the sunlight and reduce heat loss on north-facing sides. They are also highly insulated to reduce flow of heat/energy through the glass and frames.
- **Minimized thermal bridges** using special framing techniques, or by installing a continuous layer of insulation around the outside of the whole building. Slab extensions (e.g., for balconies) should be minimized, or use support materials that vastly reduce thermal bridges.
- **Airtightness** that maintains a continuous air barrier around the building, where possible, then seals up any necessary seams – such as those around windows, doors, balconies, and other protrusions.

More information is available in BC Housing's ***An Illustrated Guide to Achieving Airtight Buildings***, which will be made available on **energystepcode.ca** upon its publication in the fall of 2017.

What is a Thermal Bridge?

A thermal bridge is a spot in the building envelope that transfers heat more quickly than the rest of the building envelope – for example, a metal-framed wall has a thermal bridge at each stud because metal transfers more heat than the insulation between the studs. With appropriate training and materials, builders can learn to construct building envelopes that reduce or eliminate these bridges, reducing energy consumption. The image in Figure 6 shows the results of "thermal imaging" – a tool for seeing where heat is being transferred through the building envelope. On the top, the image shows thermal bridges at every stud, as well as leaking around windows and through the roof. On the bottom, the addition of an air barrier and continuous insulation has reduced thermal bridges, and improved sealing around windows and doors.

Figure 6: *Example thermal images of a building demonstrating thermal bridges. Areas that are red and yellow show a lot of heat escaping through the building envelope. Blue and green areas show much less heat is escaping. Photo credit: Dow Chemical Company.*

5.3 The Equipment and Systems

An energy-efficient building will minimize the energy needed to run all of the heating, cooling, ventilation, and hot water equipment and systems. By focusing first on a high-quality envelope, the energy needed for heating and cooling is already greatly reduced and will require less energy from equipment and systems. That said, there are still significant opportunities to reduce energy use with efficient equipment (see Figure 7 for a depiction of the equipment and systems in a building).

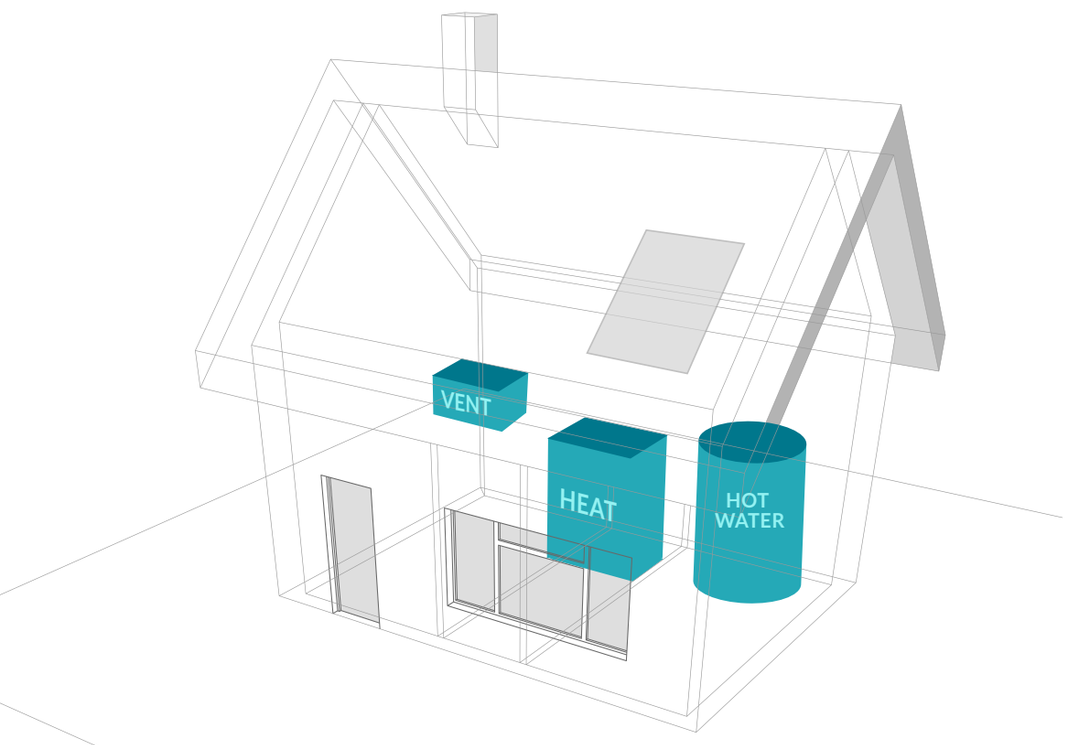


Figure 7: Depiction of the equipment and systems in a building

The key elements of high-performance equipment and systems include:

- **Heating systems** in efficient buildings vary greatly from high-efficiency furnaces and boilers to heat pumps or electric baseboard heating (where the building envelope is very efficient and only a small amount of baseboard heat is needed). An important consideration when selecting a heating system is to ensure it is sized to match the needs of the building.
- **Cooling systems** play a smaller role in energy use in BC, though they may become more important over time as summer peak temperatures increase due to global climate change. While they currently have limited use in homes, they are typically quite efficient in commercial applications. In energy-efficient buildings, cooling can be provided through high-efficiency air conditioning systems, or through heat pumps. Cooling needs are reduced with efficient building envelopes, together with windows that cut solar gain.
- **Ventilation systems** are important for providing fresh air to a building. To be most energy-efficient, these systems will capture and transfer heat from the air exiting the building to the new replacement air entering the building through the use of a Heat or Energy Recovery Ventilator (HRV or ERV). This is also a chance to filter the new air to reduce pollutants.
- **Hot water systems** in efficient buildings vary from high-efficiency tanks and boilers, to on-demand systems that heat water only as needed, to heat-pump systems. Efficient systems may also capture heat from the drainwater and transfer it to preheat the hot water.

Heat-recovery ventilators (HRV)/ Energy-recovery ventilators (ERV): These systems harvest the heat from stale outgoing air and use it to preheat incoming air, supplying fresh outside air to the space while reducing the amount of energy needed to bring it up to room temperature. HRVs and ERVs help buildings improve energy efficiency, and can be helpful in achieving the Upper Steps. ERVs can also help control indoor humidity levels.

Photo: Spruce Grove house in Whistler, by Kristen McGaughey Photography.

5.4 Airtightness Testing

Airtight construction minimizes air leaks through holes, cracks, or gaps in the building envelope. In addition to reducing the loss of heated air, it also reduces drafts, making the building much more comfortable. Airtight construction involves maintaining a continuous air barrier around the building where possible, then sealing up any necessary seams – such as those around windows, doors, balconies, and other protrusions. **This means paying attention to detail during the construction process to reduce or eliminate holes or gaps in the building's air barrier.** This is already required in the base ***BC Building Code***, but there is no requirement to test it.

In the ***BC Energy Step Code***, airtightness testing is required for all steps and all building types before occupancy. Part 9 buildings must meet escalating levels of airtightness for Steps 2 to 5. In homes, a "blower door test" is used to evaluate airtightness (see text box to the right for a depiction of an airtightness test).

Although airtightness testing has been used in homes for many years (including as a requirement for Federal and Provincial incentive programs in the past), the testing of airtightness in large commercial buildings is a newer practice in BC.[1] The ***BC Energy Step Code*** introduces required airtightness testing and reporting using specific methods for all Part 3 buildings, but there are no required levels of airtightness that must be met to achieve the steps. Note that the building energy model must account for the result of the airtightness tests for Part 3 buildings in Steps 2 to 4.

1. Although newer to BC, all commercial and residential buildings over three stories have required whole-building airtightness testing in Washington State and Seattle building codes since 2009.

What is a Blower Door Test?

A **blower door test** is a standardized test to measure how tightly a building is sealed against air leakage and heat loss. To perform the test, a technician closes all doors and vents and temporarily installs an air barrier in a doorway that uses an integrated fan (see Figure 8). The fan changes the pressure inside the building, allowing the tech to measure how quickly air is entering or leaving the building via cracks and leaks. The test results show how much air passes through the building envelope, when the building is at a specified pressure. While a blower door test is required pre-occupancy, it may also be helpful at a midpoint inspection to ensure any leaks in the envelope are repaired before drywall is in place.

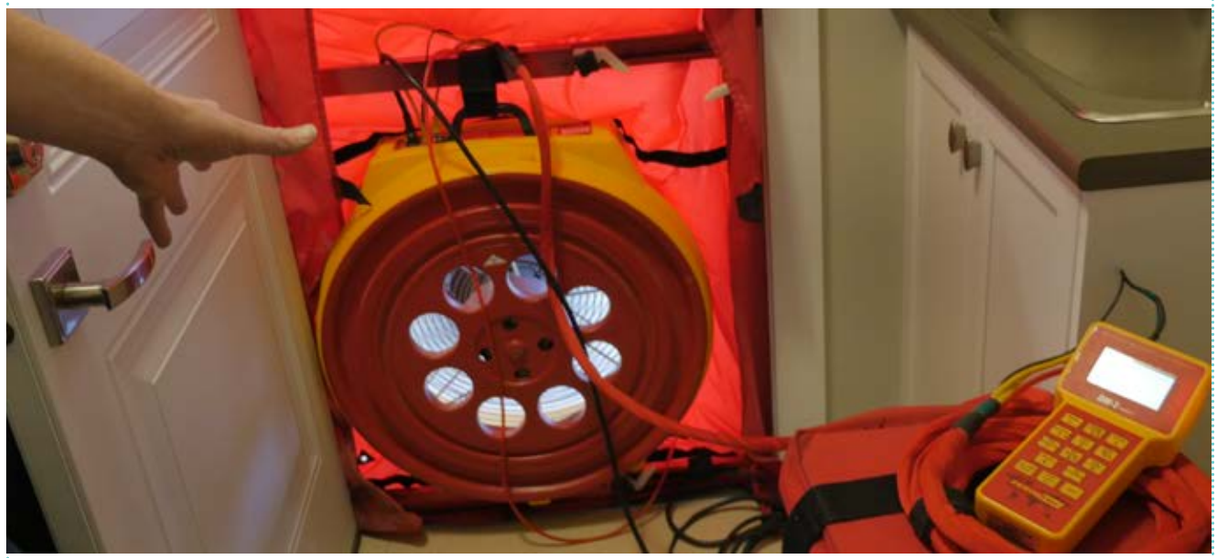


Figure 8: Blower door test in action

5.5 Metrics used in the BC Energy Step Code

The following metrics are used in the ***BC Energy Step Code*** to assess which step a building achieves. The Building Envelope Metrics and the Equipment and Systems Metrics are demonstrated through a whole-building energy model of the design, while the Airtightness Metric is demonstrated through an on-site test of the building before occupancy. See ***Appendix A*** for a table of the required values by step for different climate zones and different building types.

	PART 9	PART 3
Building envelope metrics	***Thermal Energy Demand Intensity (TEDI):*** The amount of annual heating energy needed to maintain a stable interior temperature, taking into account heat loss through the envelope and passive gains (i.e., the amount of heat gained from solar energy passing through the envelope or from activities in the home like cooking, lights, and body heat). It is calculated per unit of area of the conditioned space over the course of a year, and expressed in kWh/(m^2·year).	
	Peak Thermal Load (PTL): The maximum amount of energy needed to heat a building on the coldest day of the year, expressed in W/m^2 of conditioned space. Energy modellers also refer to this as "Design Heat Loss."	
Equipment and systems metrics	***Percent Lower than EnerGuide Reference House:*** An EnerGuide reference house establishes how much energy a home would use if it was built to base building code standards. This metric identifies how much less energy - stated as a percentage - the new home will require compared to the reference house. ***Mechanical Energy Use Intensity:*** The modelled amount of energy used by space heating and cooling, ventilation, and domestic hot water systems, per unit of area, over the course of a year, expressed in kWh/(m^2·year).	***Total Energy Use Intensity:*** The modelled amount of total energy used by a building, per unit of area, over the course of a year, expressed in kWh/(m^2·year). It includes plug loads - appliances, lighting, entertainment systems, and so on - and process loads, namely heating, cooling, fans, and other mechanical systems. Some exceptions for unique situations are permitted (for example, electric vehicle charging), as outlined in the modelling guidelines referenced in the ***BC Energy Step Code*** regulation. This metric may be challenging to achieve for specific buildings that have high process loads (for example, restaurants, hospitals, or large computer server farms).
Airtightness metrics	***Air Changes per Hour at a 50 Pa Pressure Differential (ACH_{50}):*** The number of times the full volume of air in the building exchanges in an hour when a building is at a specified pressure, different than the outdoor air pressure, as measured by a "blower door test". This measures the airtightness of the building (or how much air leaks through the building envelope).	***Air Leakage Rate:*** A measure of the rate that air leaks through the building envelope per unit area of the building envelope, as recorded in L/(s•m^2) at a 75 Pa pressure differential.

6 Conclusion

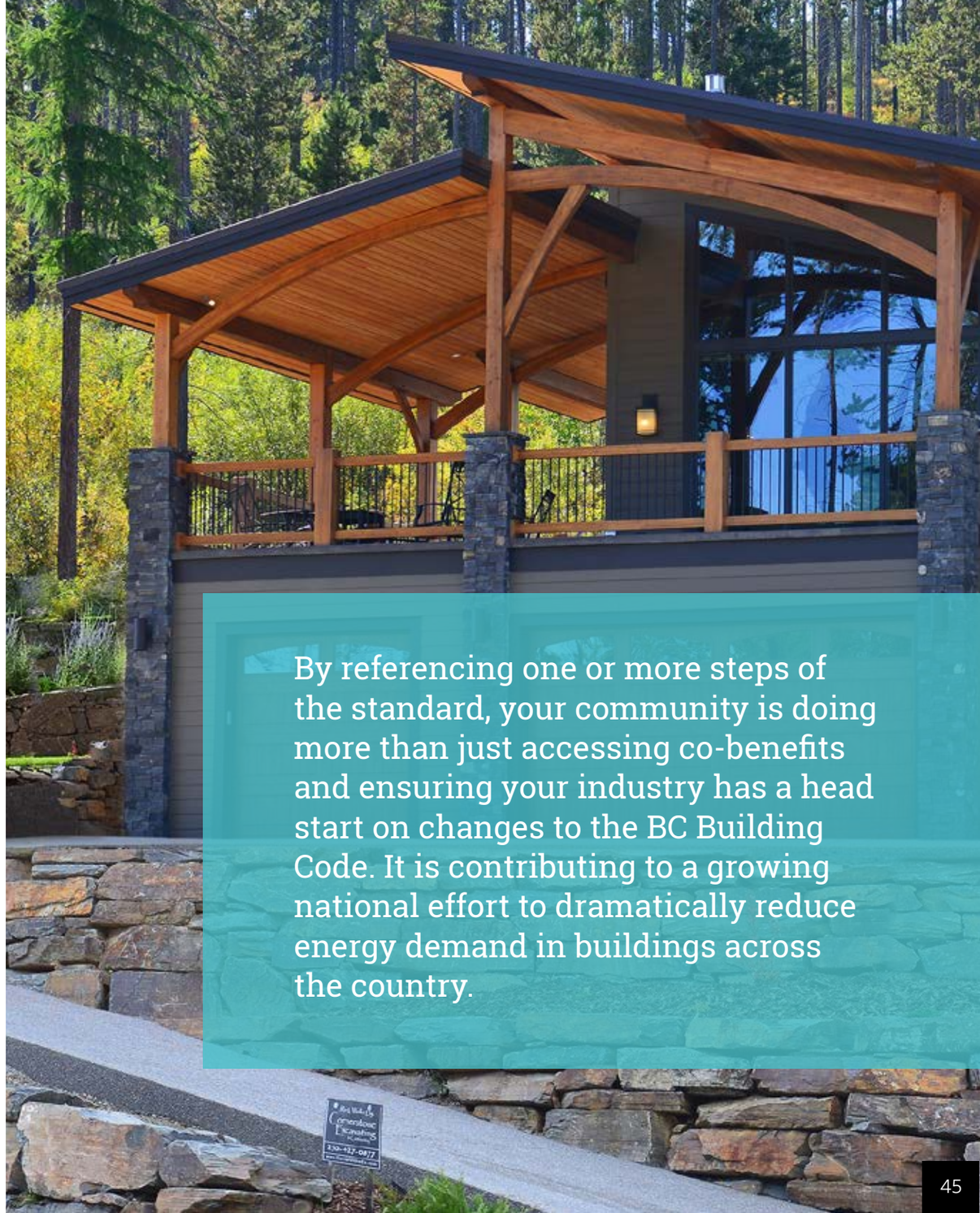
The ***BC Energy Step Code*** emerged from a desire to provide a consistent set of higher-efficiency standards for the building industry, while offering local governments a simple and effective set of standards to support their efforts to meet targets for energy efficiency and greenhouse gas emissions. The Energy Step Code Council is keenly interested in ensuring the ***BC Energy Step Code*** is adopted in a coordinated and thoughtful manner to ensure these benefits come to fruition for all parties. For that reason, it is important that local governments follow the guidance offered in this document.

Governments that do adopt one or more steps of the ***BC Energy Step Code*** will be getting a head start on coming revisions to the base ***BC Building Code***. Over the coming years, the Province of British Columbia has committed to gradually align the base ***BC Building Code*** with the ***BC Energy Step Code*** standard. Eventually, the Lower Steps will be required practice for all construction – across the board – followed by the Upper Steps. By 2032 all new buildings will be net-zero energy ready as the minimum code.

The Energy Step Code Council is also encouraging local government leadership by requiring the Upper Steps for any public-building project that may be on the horizon, such as a community centre or public-safety complex. These buildings will serve as high-profile case studies – building local capacity while demonstrating to the market what can be accomplished.

By referencing one or more steps of the standard, your community is doing more than just accessing co-benefits and ensuring your industry has a head start on changes to the ***BC Building Code***. It is contributing to a growing national effort to dramatically reduce energy demand in buildings across the country.

Photo: Energy efficient home in Kimberley that participated in the City's program. Photo by Chris Pullen, Cranbrook Photo (Part 9, at least Step 2)



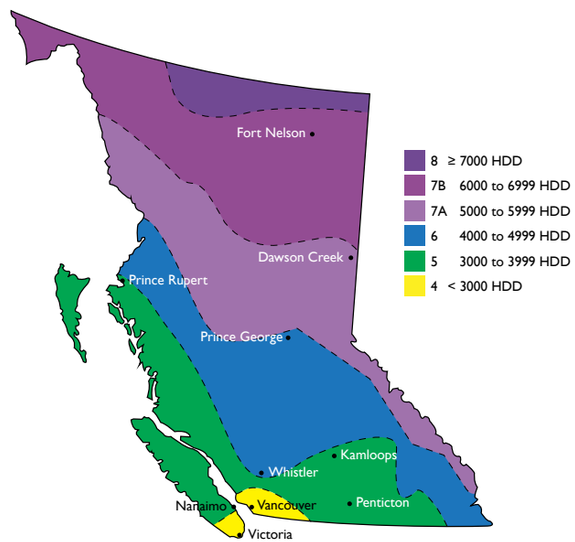
By referencing one or more steps of the standard, your community is doing more than just accessing co-benefits and ensuring your industry has a head start on changes to the BC Building Code. It is contributing to a growing national effort to dramatically reduce energy demand in buildings across the country.

Appendix A: Step Code Metrics for Energy Efficiency

Table 9.36.6.3.A. Requirements for Buildings Located Where the Degree-Days Below 18°C Value is Less than 3000 (Climate Zone 4)[1]

Forming Part of Sentence 9.36.6.3.[1]

STEP	AIRTIGHTNESS (AIR CHANGES PER HOUR AT 50 PA PRESSURE DIFFERENTIAL)	PERFORMANCE REQUIREMENT OF BUILDING EQUIPMENT AND SYSTEMS	PERFORMANCE REQUIREMENT OF BUILDING ENVELOPE
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or Conform to Subsection 9.36.5.	
2	≦ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption **or** mechanical energy use intensity ≦ 60 kWh/m².year	Thermal energy demand intensity ≦ 45 kWh/m².year **or** Peak thermal load ≦ 35 W/m²
3	≦ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption **or** mechanical energy use intensity ≦ 45 kWh/m².year	Thermal energy demand intensity ≦ 40 kWh/m².year **or** Peak thermal load ≦ 30 W/m²
4	≦ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption **or** mechanical energy use intensity ≦ 35 kWh/m².year	Thermal energy demand intensity ≦ 25 kWh/m².year **or** Peak thermal load ≦ 25 W/m²
5	≦ 1.0	Mechanical energy use intensity ≦ 25 kWh/m².year	Thermal energy demand intensity ≦ 15 kWh/m².year **or** Peak thermal load ≦10 W/m²



Map of BC Climate Zones. The BC Energy Step Code for Large and Complex Buildings (Part 3) is only available in Climate Zone 4.

([1])See Sentence 1.1.3.1.(1) of Division 2 and Table C-2 in Appendix C of the Regulation of the Minister of Natural Gas Development and Minister Responsible for Housing and Deputy Premier, Building Act, Ministerial Order No. M158, dated April 6, 2017 (http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/revisions-and-mo/mo158-bcreg138-2017-bcbcreg.pdf)

Table 9.36.6.3.B. Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 3000 to 3999 (Climate Zone 5)[1]

Forming Part of Sentence 9.36.6.3.[1]

STEP	AIRTIGHTNESS (AIR CHANGES PER HOUR AT 50 PA PRESSURE DIFFERENTIAL)	PERFORMANCE REQUIREMENT OF BUILDING EQUIPMENT AND SYSTEMS	PERFORMANCE REQUIREMENT OF BUILDING ENVELOPE
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or Conform to Subsection 9.36.5.	
2	≦ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption **or** mechanical energy use intensity ≦ 90 kWh/m².year	Thermal energy demand intensity ≦ 60 kWh/m2.year **or** Peak thermal load ≦ 55 W/m²
3	≦ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption **or** mechanical energy use intensity ≦ 75 kWh/m².year	Thermal energy demand intensity ≦ 60 kWh/m².year **or** Peak thermal load ≦ 45 W/m²
4	≦ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption **or** mechanical energy use intensity ≦ 45 kWh/m².year	Thermal energy demand intensity ≦ 40 kWh/m².year **or** Peak thermal load ≦ 40 W/m²
5	≦ 1.0	Mechanical energy use intensity ≦ 25 kWh/m².year	Thermal energy demand intensity ≦ 15 kWh/m².year **or** Peak thermal load ≦ 10 W/m²

([1]) See Sentence 1.1.3.1.(1) of Division 2 and Table C-2 in Appendix C of the Regulation of the Minister of Natural Gas Development and Minister Responsible for Housing and Deputy Premier, Building Act, Ministerial Order No. M158, dated April 6, 2017 (http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/revisions-and-mo/mo158-bcreg138-2017-bcbcreg.pdf)

Table 9.36.6.3.C Requirements for Buildings Located Where the Degree-Days Below 18°C Value is greater than 3999 (Climate Zone 6, 7a, 7b, and 8)

Forming Part of Sentence 9.36.6.3.[1]

STEP	AIRTIGHTNESS (AIR CHANGES PER HOUR AT 50 PA PRESSURE DIFFERENTIAL)	PERFORMANCE REQUIREMENT OF BUILDING EQUIPMENT AND SYSTEMS	PERFORMANCE REQUIREMENT OF BUILDING ENVELOPE
1	N/A	EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or Conform to Subsection 9.36.5.	
2	≦ 3.0	EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption **or** mechanical energy use intensity ≦ 100 kWh/m².year	Thermal energy demand intensity ≦ 70 kWh/m².year **or** Peak thermal load ≦ 55 W/m²
3	≦ 2.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption **or** mechanical energy use intensity ≦ 85 kWh/m².year	Thermal energy demand intensity ≦ 60 kWh/m².year **or** Peak thermal load ≦ 50 W/m²
4	≦ 1.5	EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption **or** mechanical energy use intensity ≦ 55 kWh/m².year	Thermal energy demand intensity ≦ 50 kWh/m².year **or** Peak thermal load ≦ 45 W/m²
5	≦ 1.0	Mechanical energy use intensity ≦ 25 kWh/m².year	Thermal energy demand intensity ≦ 15 kWh/m².year **or** Peak thermal load ≦ 10 W/m²

([1])See Sentence 1.1.3.1.(1) of Division 2 and Table C-2 in Appendix C of the Regulation of the Minister of Natural Gas Development and Minister Responsible for Housing and Deputy Premier, Building Act, Ministerial Order No. M158, dated April 6, 2017 (http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/revisions-and-mo/mo158-bcreg138-2017-bcbcreg.pdf)

(2) Except as permitted by Sentence (3),

a) Energy performance shall be calculated in conformance with Article 9.36.6.4., and

b) Airtightness shall be tested in accordance with Article 9.36.6.5. (See Appendix A)

(3) Buildings designed and constructed to conform to Step 5 of any Tables 9.36.6.3 A. to C. and to the Passive House Planning Package, version 9 or newer, are deemed to comply with this Subsection if the energy model according to which the building is designed and constructed is prepared by a Certified Passive House Designer, or Certified Passive House Consultant, who is approved by the Passive House Institute.

Table 10.2.3.3.A. Energy Performance Requirements for Residential Occupancies

Forming Part of Sentences 10.2.3.3.(1) and (2)

STEP	EQUIPMENT AND SYSTEMS – MAXIMUM TOTAL ENERGY USE INTENSITY (KWH/M²•YEAR)	BUILDING ENVELOPE – MAXIMUM THERMAL ENERGY DEMAND INTENSITY (KWH/M²•YEAR)
1	Conform to Part 8 of the NECB	
2	130	45
3	120	30
4	100	15

Table 10.2.3.3.B. Energy Performance Requirements for Business and Personal Services or Mercantile Occupancies

Forming Part of Sentences 10.2.3.3.(1) and (2)

STEP	EQUIPMENT AND SYSTEMS – MAXIMUM TOTAL ENERGY USE INTENSITY (KWH/M²•YEAR)	BUILDING ENVELOPE – MAXIMUM THERMAL ENERGY DEMAND INTENSITY (KWH/M2•YEAR)
1	Conform to Part 8 of the NECB	
2	170	30
3	170	20

Appendix B: Relation Between BC Energy Step Code and Other Certification Programs

The following table provides an approximate "equivalency" between certification standards developed by third parties and the ***BC Energy Step Code,*** where such a comparison is possible. The table may assist with local governments that are transitioning existing programs and bylaws to conform with the changes to the ***Building Act***. Compliance or certifications to third-party standards do not guarantee compliance with the *BC Energy Step Code*.

Part 9:

STEP 1	EnerGuide Rating System, Built Green Bronze
STEP 2	Built Green Silver
STEP 3	ENERGY STAR, Built Green Gold and Platinum
STEP 4	R2000
STEP 5	Passive House, Net-Zero Energy Ready

There are several certification programs and rating systems that support greater energy efficiency, but equivalencies to the ***BC Energy Step Code*** have not been established for every program. Some also address aspects of building design that are beyond the scope of the ***BC Energy Step Code***. Programs such as LEED and Built Green take a holistic approach, addressing a broad spectrum of direct and indirect sources of GHG emissions as well as important aspects of sustainability such as water efficiency, ecological impact, and the health and wellness of occupants.

The energy efficiency requirements of the available certification programs and rating systems may align and contribute to the achievement of the ***BC Energy Step Code***. For example, the EnerGuide rating system can be the basis for demonstrating compliance to steps 1, 2, 3 and 4 of the ***BC Energy Step Code*** for Part 9 buildings, as detailed earlier in this document. In turn, the LEED rating system leverages the EnerGuide Rating System to establish a minimum required level of energy performance and award points for greater efficiency; this facilitates the voluntary application of LEED in conjunction with the ***BC Energy Step Code***.

“The University of British Columbia developed energy efficiency requirements for campus buildings back in 2006, and introduced performance-based targets in 2013. We’re now in the process of aligning our standards with the BC Energy Step Code. It’s great to be part of a province-wide market transformation, and my team is happy to be in good company with other jurisdictions that are now starting to move up the same high-performance staircase.

John Madden, Director, Sustainability and Engineering, University of British Columbia

Photo: North Park Passive House condominium development, Victoria, BC (Part 9, Step 5)

Visit the BC Energy Step Code web site (energystepcode.ca) for resources, updates, training publications, and webinars.