BC Energy Step Code Training Overview

BC HOUSING

Module 1: BC Energy Step Code Overview and Requirements

This module sets the groundwork for the overall design and compliance process and shares the motivation behind this evolution towards performance-based code. It is not intended to cover design principles for the BCESC since it is covered in Module 2.

MODULE 1 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Recognize the importance of building housing in BC that responds to climate change through energy efficiency, durability, and comfort, for a diverse range of occupants.	1.1	Present evidence to team members and clients that modelled projected climate conditions indicate a need for houses with improved home energy efficiency, durability, and occupant comfort.
	1.2	Compare at a high level the energy use, durability, occupant comfort characteristics, and potential broader climate impacts of "business-as-usual" houses with those of a Step 3 or higher houses, including for a diverse range of Part 9 housing formats and users.
Formulate an appropriate explanation for team members and clients from diverse backgrounds on how the BC Energy Step Code works, its benefits, its origin, and its primary goals.	1.3	Explain to a layperson how the BCESC compliance pathway works, its origin, and the need for a code that regulates energy efficiency.
	1.4	Explain to a diverse range of clients and team members how the BCESC compliance pathway can offer value both financially and in comfort to end users, especially in the context of future climate conditions and its impact on at- risk populations.
	1.5	Identify how a performance-based BCESC Step 3 compliant home's design and construction process is different from a current prescriptive-based building, the benefits in increased flexibility, and how it can effectively accommodate a diverse range of Part 9 house formats.
	1.6	List the owner/occupant benefits of a home built to BCESC Step 3 or higher from an energy usage and building operation perspective.
Assess quantitatively a building's BC Energy Step Code compliance based on energy modelling results using thermal and mechanical energy use metrics.	1.7	Identify the primary building design characteristics that contribute to a building's ability to meet the requirements of Step 3 and above, and potential challenges associated with diverse Part 9 housing formats and locations in BC.
	1.8	Check that a building energy model reported energy usage metrics comply with Step 3 BCESC requirements, and be able to translate the outcomes of the energy report in plain language (grade 5 level) to a client/homeowner.
	1.9	Consider greenhouse gas emissions, both for intensity and total use, from building energy fuel type, the use of low carbon non electric fuels, and the future compliance metrics that may govern their use.*
Coordinate the completion of modelling, testing, submissions, and inspections needed in the BC Energy Step Code compliance process for a diverse range of Part 9 construction projects.	1.10	Assign the appropriate party for filling out sections of the compliance report and understand the typical timing of generating inputs.
	1.11	Check compliance report for correctness and realistic assumptions, including for diverse building characteristics, and communicate effectively with team members to gain assurance that compliance report inputs are correct.

* This learning objective is intended to introduce the concept and only requires that the student be able to "consider" the implications of the potential Code requirements on design.

Module 2: Meeting the BC Energy Step Code by Design

This module provides an overview of how architectural and mechanical design choices can have a significant impact on certain building performance parameters, which can either help or hinder compliance as well as impact overall cost.

MODULE 2 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Explain to team members and clients the basic considerations for designing and building to the BCESC both for Step 3 and beyond, including considerations for future climate readiness, market expectations, potential cost implications, diverse building types, and future code readiness.	2.1	Identify project coordination efforts that should be implemented to ensure design strategies are considered by the whole team.
	2.2	Understand how house size/ratio/orientation and window size/orientation can impact home energy performance and construction cost, including for a diverse range of Part 9 housing types.
	2.3	List common BC design and construction approaches that might have to be adjusted as Step 3 of the BCESC becomes code minimum, and as the BCESC progresses up to Step 5 with an increased focus on resilience.
	2.4	Communicate effectively to a diverse project team the key characteristics that should be considered at early-stage design for each of the building elements and track these decisions before permitting.
	2.5	Compare mechanical systems that may become more common with Step 3 houses and beyond including their impact on energy use, and the home's characteristics that impact mechanical design.
Assess qualitatively a building's likelihood of meeting various performance requirements of the BC Energy Step Code based on its design elements.	2.6	Estimate overall relative energy usage based on house shapes and ratios without knowing specific thermal or mechanical performance numbers.
	2.7	Suggest improvements and potential optimization of a building's overall design to help more easily achieve code requirements, while considering the diversity of building types and occupants.
	2.8	Identify key detailing and building form elements that can impact airtightness, thermal performance, and mechanical system installation.
	2.9	Evaluate energy model metrics that can indicate heating and cooling thermal comfort for the occupant, including ventilation parameters.

Module 3: Building Science for the BC Energy Step Code

This module builds on basic building science principles and applies them to the evolving/emerging enclosure design and construction practices required to meet the "envelope first" approach. This is not intended as a building science fundamentals course, but must still set the groundwork for the training completed in Module 4.

MODULE 3 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Apply building science principles to help in the selection of durable building components, assemblies, and construction approaches in the diverse British Columbia climate and market.	3.1	Identify the key characteristics of typical building assemblies that impact the energy performance of the building.
	3.2	List the key enclosure selection criteria that affect the building construction cost and schedule.
	3.3	Use building science principles to guide the evolution of the design and construction of building enclosures with increased R- value in the "envelope first" approach, accounting for BC's five climate zones and diverse building types and occupancies.
	3.4	Assess and mitigate the potential impacts of solar heat gain on occupant comfort, including a basic understanding of the solar heat gain coefficient, low-e coatings, window operability, and influence of mechanical systems.
	3.5	Differentiate between enclosure elements and construction practices for achieving airtightness and those intended for vapour control.
Use industry resources to determine appropriate enclosure components and assemblies, mechanical components, and construction approaches that can be used to meet the current and future requirements of the BCESC and achieve best practices.	3.6	Find typical ranges of assembly R-values associated with wood- frame, below-grade concrete and wood-frame roof assemblies.
	3.7	Be mindful of prescriptive code items that still apply to building enclosures even if they are used as part of performance-based compliance and of design approaches that may require design professional involvement/sign-off during assembly selection.
	3.8	Consider the five key design and construction criteria of cost efficiency, constructability, airtightness, moisture durability, and sustainability in selecting an appropriate enclosure assembly.
	3.9	Assess the benefits of an exterior-insulated assembly compared to an interior-insulated assembly in terms of building science principles.
	3.10	Evaluate a window product based on key characteristics including NAFs rating, energy, durability, design options.
	3.11	Evaluate industry resources, product documentation, and training programs for their suitability as tools for builders in the context of the BCESC, including for diverse builder teams and building design perspectives.

Module 4: Building Envelope Options for the BC Energy Step Code

This module introduces builders to the different options they have to achieve higher performance levels when it comes to the building assemblies and their interfaces.

MODULE 4 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Compare and contrast the performance, cost, constructability, compatibility, and future- readiness parameters at play in the design and construction of modern enclosure assemblies that are used in buildings meeting the BC Energy Step Code.	4.1	Identify exterior wall assembly configurations that optimize cost, durability, thermal performance including reduced thermal bridging, and buildability in all climate zones in BC.
	4.2	Develop basic strategies for constructing wall assemblies that use exterior insulation that are durable and buildable.
	4.3	Manage key design and construction concerns for below-grade concrete assemblies with increased thermal performance including reduced thermal bridging, while using moisture control best practices.
	4.4	Manage key design and construction concerns for roof assemblies with increased thermal performance including reduced thermal bridging, and airtightness, while using moisture control and resilience best practices.
	4.5	Understand the typical correct sequence of exterior wall membrane installation that includes for airtightness and use of exterior insulation, and identify the parties in charge of each step in this sequence.
	4.6	Understand the typical correct sequence of exterior insulation installation, and identify the parties in charge of each step in this sequence.
	4.7	Understand the correct overall sequence of typical airtightness and insulation detailing, and identify the parties in charge of each step in this sequence.
	4.8	Align cost and construction priorities across the project team and with the owner/client, including for a diverse group of trades/subcontractors with a varying understanding of enclosure assemblies.
Plan the construction of enclosure assemblies, including aligning a diverse range of trades/subcontractors, managing supply chains, sequencing site work, and ensuring correct installation practices are used.	4.9	List key planning considerations that contribute to the successful construction of a cost-effective building enclosure across a range of diverse housing types.
	4.10	Identify key building specification and drawing information that assist in enclosure assembly selection and construction, including key product information, detailing accessories, assembly thickness constraints, and window specifications.
	4.11	Determine core competencies needed by team members in the enclosure construction process and implement ways to train them considering diverse backgrounds and learning styles, especially Indigenous persons and those from equity seeking groups.
	4.12	Summarize the factors that can lead to improper installation and poor quality control in building enclosure construction, and how they can be addressed during design and early stage construction.

Module 5: Air Barriers for the BC Energy Step Code

This module discusses the different options that builders have when selecting an air barrier approach, and the important planning steps associated with a successful air barrier.

MODULE 5 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Select an appropriate air barrier approach for a given roof, wall, floor, and party- wall assembly based on performance, cost- effectiveness, and constructability, bearing in mind current and future BCESC requirements.	5.1	Appreciate the importance of the building air barrier as a way of significantly improving energy efficiency with minimal construction cost implications.
	5.2	Understand how airtightness impacts energy performance from code minimum to current practices to best practice.
	5.3	Describe the four attributes of a correctly installed building air barrier: air impermeability, durability, continuity, and stiffness.
	5.4	Compare the design and construction sequence considerations of typical interior and exterior air barrier systems, including key details for implementing them successfully.
	5.5	Assess cost trade-offs of different air barrier approaches including materials, installation techniques, sequencing, and effectiveness.
Apply knowledge of the correct design and installation practices for a given air barrier approach to properly manage the planning, installation, and testing of the building's complete air barrier.	5.6	List the key factors that contribute to the successful installation of a complete air barrier system.
	5.7	Manage the key wood-frame construction practices that can interfere with achieving a successful air barrier, including coordination and education for all trades interacting with the enclosure.
	5.8	Coordinate qualitative and quantitative testing at the appropriate times, and use results to track quality control of the air barrier.

Module 6: Mechanical Systems for the BC Energy Step Code

This module discusses correct design and construction steps for heating, cooling and ventilation systems used in BCESC homes.

MODULE 6 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Use knowledge of the basic characteristics of correctly designed and installed code compliant mechanical systems used in BCESC homes when communicating with mechanical designers and mechanical trades.	6.1	Compare strategies for improving energy efficiency and reducing emissions of mechanical systems both in the overall building design and in system selection, including for up-front and lifetime costing.
	6.2	Set expectations for deliverables from the energy modeller and mechanical contractor regarding right-sizing, design and installation, quality assurance, and verification/ commissioning.
	6.3	Assess basic mechanical installations for overall quality and communicate with designers/installers on areas of concern.
	6.4	Evaluate basic code-compliant mechanical systems design and installation approaches and use industry resources to guide selection of appropriate heating/cooling/ventilation systems likely to be used in homes complying with Step 3 and beyond.
	6.5	Compare cost implications of the installation and operation of typical mechanical systems as part of selection and evaluation process, including maintenance and lifecycle implications.
	6.6	Manage the sequencing and coordination of the mechanical system installation and verification on site to account for the BCESC compliance process including for airtightness testing, inspections, commissioning, and compliance reports.
	6.7	Assess modern and emerging mechanical systems for suitability and integration with homes built to BCESC Step 3 and beyond, especially relating to increased airtightness and future GHGI considerations.
	6.8	Consider throughout design and construction the diverse range of occupants such as Indigenous persons, elderly, and those from equity seeking groups, who will be using the mechanical system to control interior conditions to meet their needs.

Module 7: Building Envelope Quality Assurance and Quality Control

This module focuses firstly on building envelope details that are more commonly associated with performance issues, and secondly on the quality assurance and control of the air barrier, and on diagnosis and repair of the air barrier with the assistance of air tightness testing.

MODULE 7 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Use basic quality assurance and quality control tools like mockups and airtightness testing to achieve airtight durable enclosures.	7.1	Plan the correct sequencing for typical detail installation relating primarily to air barrier and insulation, without compromising other control functions and durability.
	7.2	Identify key building enclosure QA/QC items from construction documents and plan for ways to address them including modifying details and using mockups.
	7.3	Understand the scheduling, preparation, and testing process for airtightness testing at mid-construction and for final compliance, for both detached and attached homes.
	7.4	Assess the suitability of qualitative and quantitative testing techniques in the construction process for BCESC homes, including challenges with diverse housing types.
Coordinate QA/QC measures for enclosure detailing and airtightness control, including enlisting the correct parties responsible and tracking items from design through to completion.	7.5	Use checklists to manage QA/QC of key enclosure items related to BCESC compliance steps from design to completion, including avoiding costly errors and need for repairs through effective quality assurance.
	7.6	Effectively communicate to trades the key QA/QC items related to BCESC compliance, and identify and mitigate potential conflict and bias that might arise between team members especially relating to differing cultural backgrounds.
	7.7	Identify desirable qualifications and responsibilities for an onsite QA/QC supervisor to support all aspects of BCESC compliance, including insulation, airtightness, and mechanical systems.
	7.8	Enlist appropriate personnel, tools, and techniques for repairing incomplete enclosure items and improving building airtightness.
	7.9	Integrate key quality assurance and quality control language relating to BCESC compliance into contract agreements with designers and trades, including performance-based contractual obligations.

Module 8: BC Energy Step Code Project Management

This module presents ways in which the builder can manage the project, in cooperation with the rest of the project team and the trades, to achieve the expected performance levels.

MODULE 8 LEARNING OUTCOMES AND OBJECTIVES		
Learning Outcomes	**#**	**Learning Objectives**
Recognize the design and construction factors contributing to the success or failure of a building project in meeting its goals such as meeting BCESC requirements, staying on budget and on schedule, and maintaining working relationships with team members and clients.	8.1	Recognize the overarching opportunity and impacts of the BCESC compliance process on project delivery approaches, including the value of early stage design and the use of the Integrated Design Process.
	8.2	Adjust project scheduling to account for coordinating supply chains and subcontractors in the context of the enclosure and mechanical systems and the compliance process associated with the BCESC.
	8.3	Consider how the project can approach capacity development through inclusive training that considers the diverse range of trades/subcontractors entering the industry.
	8.4	Determine steps required to adjust current building processes to better integrate the BCESC compliance processes.
	8.5	Coordinate the use of the Integrated Design Process in BCESC project delivery to manage costs and trade-offs.
Integrate broad project management and QA/QC tools that help lower the risk of failing to meet project goals.	8.6	Set out expectations for team members around the timing of on- site checks including testing and inspections, interfacing with building official(s), and filling out and checking the compliance form.
	8.7	Align project goals across team members to reduce miscommunication, and set up appropriate supports for team members including feedback and incentive structures for meeting quality and compliance targets.
	8.8	Prepare safeguards and contingencies to mitigate and respond to missed BCESC requirements such as failed airtightness tests and energy modelling results.