Outline: Applied Building Science

TOTAL TRAINING DURATION

21 Hours total:

- Pre-workshop Learning Activities 6.5 hours
- Workshop 12.5 hours
- o Post-workshop webinar 2.0 hours

WORKSHOP DATES

- In-Person Training September 6th 7th, 2023
 Location: Construction Instruction Experience Center
 6850 Argonne St, Unit 100, Denver, Colorado
- Webinar with Gord Cooke September 21st, 2023

WORKSHOP OVERVIEW

This 21-hour training includes two full workshop days with hands on classroom instruction and supplemental online and virtual training. It allows participants to learn and experience the building science physics of air, heat and moisture flow. This knowledge will form a basis for what every designer and builder should know so they can mark informed decisions for design, material choices, methods and details that perform well in each specific climate zone.

The course will address critical home performance elements that exist as a system and are part of high-performance, energy-efficient, sustainable homes. Participants will learn about building enclosure elements and the impact they have on heating, ventilation and air conditioning design and performance to ensure buildings are safer, healthier, more comfortable, more durable as well as energy efficient.

The workshop provides hands-on learning opportunities in a demonstration and experience center to identify cost-effective techniques and strategies for designers and builders of single-family and multi-family new homes and renovations.



LEARNING OBJECTIVES

- 1. Learn the elements of high-performance homes and how they help respond to changing codes, programs, and standards, as well as the ever-increasing expectations of homeowners.
- 2. Understand the fundamentals of air, heat and moisture flow and see how they can be applied to make better material and methods decisions.
- 3. Learn the common metrics and methods of performance testing for water, heat, and airflow management in the residential construction industry.
- 4. Identify a decision matrix for comparing and selecting appropriate building materials for foundations, walls, roofs, and windows. Dozens of building materials and assemblies will be available for participants to evaluate.
- 5. Identify building process changes needed to cost-effectively implement elements of high-performance homes.
- 6. Understand the basics of HVAC design and equipment options and how they are impacted by building enclosure decisions made by designers and builders.



PRE-WORKSHOP LEARNING ACTIVITIES — 6.5 HOURS

Getting it Right — Part 1, Thermal Enclosures

The first installation of Ci's "Getting it Right" series discusses the building science behind thermal enclosures. Thermal enclosures are considered spaces inside a building enclosure that are separate from the outdoors and non-habitable living spaces. This video explains the importance of building high-performance thermal enclosures and makes recommendations to achieve this goal.

Getting it Right — Part 2, IAQ Ventilation

This video discusses high-performance HVAC and IAQ solutions that will maintain habitant comfort within thermal enclosures. A key principle of this video is how to properly vent and heat an air-tight thermal enclosure.

Getting it Right — Part 3, Air Sealing Tactics

A key principle of a high-performance home is an airtight home. This video discusses techniques to air seal the thermal enclosure. Techniques range from sealing ductwork to discussing new technologies such as AeroBarrier.

Getting it Right — Part 4, The Future of Above-Grade Walls

Codes, homeowner expectations, and environmental changes are driving the building industry to revolutionize building enclosure solutions. New technologies, solutions, and methods must be implemented to meet these changes. This video discusses why we need to update our building practices and how to utilize high-performance above-grade walls in your next project.

How To Do It Right The First Time & Why: Meeting & Exceeding Air Tightness Goals

Have you ever completed a blower door test? This video is the one-stop place to learn how to test your air-sealing solutions to ensure you are meeting both your airtightness goals and code requirements.



WORKSHOP OUTLINE:

Day 1: Wednesday, September 6th

8:00 am - 5:30 pm (MST) - 6.5 hours of workshop content

Training Elements	Training Format
 The challenges and opportunities in the building industry associated with changing codes, building programs and homebuyer expectations. A discussion of how design choices and how builders make decisions affect the performance of buildings. 	Presentation and large and small group exercises
 Building Science Physics Introduction: The three methods of heat flow. The three forces of airflow. The four moisture flow mechanisms. 	Presentation and animations
 Lab Demonstration of Heat, Air and Moisture Flow Test methods and metrics for comparing materials. Discussion of appropriate choices for materials. Demonstration of the magnitude of forces. 	Lab experience demonstration
 Applied Building Science Applying the science to building better walls. Thermal effectiveness. Moisture control. The importance of air sealing. Material and system alternatives for different building types and climate zones. Advanced wall systems. 	Presentation and class discussion
 Building Better Walls: Demonstration and discussion of different wall assemblies and strategies for cost-effective construction techniques. Integration of thermal, water, air, and vapour control. Effective insulation installation – cavity & continuous. 	Lab experience demonstrations
 Building Better Enclosures: Demonstration of air barrier materials, methods and strategies. The metrics of air tightness. 	Lab experience demonstrations



Day 1: Continued

•	 Window Selection and Installation: Identify the performance metrics for windows and the implications on comfort, energy use and HVAC sizing. Radiant heat flow implications. 	Classroom discussion and lab demonstration
•	 Window Installation: Identify techniques for appropriate window detailing with the WRB. Detailing at roof-to-wall connections and other penetrations. Flashings, caulking and tape material selection. 	Hands-on demonstration
Op	pen Q&A, Explore the lab	



Day 2: Thursday, September 7th 8:00 am – 3:30 pm (MST) – 6.0 hours of workshop content

Training Elements	Training Format
 Applied Building Science – Roof and Attics: Roof systems. Flashing and moisture strategies. Air-sealing the ceiling plane. The thermal control possibilities. Venting – when to and not. 	Classroom presentation and animations
Roof and attic assembly demonstration.	Lab demonstration of details
 Applied Building Science – Foundations: Basements Crawlspaces Slab-on-grade Water and thermal control strategies 	Classroom presentation and animations
 Foundation details demonstration: Design options Insulation options Material selection 	Classroom exercise
 Applied Building Science – HVAC implications: Appropriate sizing for high-performance homes. Distribution system effectiveness. Equipment options and selection – including heat pumps. 	Classroom presentation and group exercises
 Indoor air quality: The sources and solutions. Ventilation, filtration, humidity control. 	Classroom presentation
 HVAC equipment demonstration: Ventilation system operation. Performance measuring tools and commissioning metrics. 	Lab experience demonstrations
Summary and Final Questions	Group discussion



POST-WORKSHOP LEARNING ACTIVITY

Webinar with Gord Cooke - 2 hours

September 21st, 2023 8:30 am – 10:30 am (MST)

This final training segment will inspire participants to discuss what they learned through this specialized applied building science training. Gord Cooke will review the main learning principles and welcome participants to ask more questions, review what solutions they will be implementing in their building practices and identify any follow-up training they would like help with.

