

<ul style="list-style-type: none"> • The Forces of Nature • The Definition of Durability • What Rules Must Be Followed? <p>5. Building Science Fundamentals</p> <p>Heat Flow</p> <ul style="list-style-type: none"> • Conduction, Convection, Radiation <p>Air Flow...</p> <ul style="list-style-type: none"> • Wind, stack, mechanical <p>Moisture Flow</p> <p>Moisture Forms – Liquid, solid, vapor</p> <p>Moisture Flows</p> <ul style="list-style-type: none"> • Liquid Water – Bulk, rain, gravity • Capillary Flow • Air Transport of Water Vapor • Diffusion <p>Air Tightness & Moisture Flow</p> <p>Air flow can assist drying</p>	30 min
<p><u>Wall and Roof Structures</u></p> <p>In this segment of the Houses That Work program the basic building science principles are applied to wall and roof structures. Effective air sealing and insulation strategies are offered and discussed. The segment helps builders choose appropriate wall, roof and insulation systems that avoid interstitial condensation and help reduce both heating and cooling loads.</p> <p>1. Air Barriers – we need houses to be tight</p> <ul style="list-style-type: none"> • Air Leakage Locations • Common Holes We Miss <ul style="list-style-type: none"> ○ Behind tubs, fireplaces, boxed framing ○ House to garage connection ○ HVAC Penetrations ○ Roof to wall intersections • Interior & exterior air barriers • Benefits of Air Sealing <p>2. Insulation – Preparing the building & be</p> <ul style="list-style-type: none"> • Warmer Corners • Interior Wall Junction • Insulating the enclosure • Insulation Must be properly installed • Insulation systems and options • Benefits of Proper Insulation <p>3. Innovative wall systems</p> <ul style="list-style-type: none"> • Advanced framing / Simplified Framing = OVE • Structurally insulated panels • Insulated concrete forms 	<p style="text-align: center; vertical-align: middle;">20 min</p> <p style="text-align: center; vertical-align: middle;">20 min.</p> <p style="text-align: center; vertical-align: middle;">15 min.</p>

<p>4. Roof Systems – similar to walls</p> <ul style="list-style-type: none"> • Ventilation needs • Conditioned attic space with no ventilation • Avoiding wind washing 	<p>15 min.</p>
<p><u>Window & Door Systems</u></p> <p>Windows constitute one of the highest dollar components of a home and have become a primary design feature. It is important for builders to understand how to accommodate more and bigger windows without compromising comfort and energy efficiency. This segment will help builders choose appropriate windows that avoid condensation and help manage both heating and cooling loads.</p> <p>1. Elements of High Performance Windows</p> <ul style="list-style-type: none"> • Low E coatings • Insulated spacers • Argon filled • Better frame technologies • Proper installation techniques 	<p>15 min</p>
<p><u>Protecting Building Systems</u></p> <p>The segment outlines important, cost effective strategies that protects building envelopes over the life of the building. Topics discussed will include proper flashing details, applying rain screen principles and managing interior moisture.</p> <p>1. Proper grading and drainage</p> <p>2. Draining wall and roof assemblies</p> <ul style="list-style-type: none"> • Rain Penetration Control • Drainage Plane • The interface between walls & roofs • Installing Windows – they need careful attention • Venting our Cladding • Creating a Continuous Drainage Plane 	<p>10 min. 40 min.</p>
<p><u>Foundations</u></p> <p>This segment will cover a thorough review of the physics of foundations and how to make them work better. Given homeowners’ expectations for more livable basements it is important for builders to turn those cold, dark, damp storage spaces into warm, dry living space. Appropriate water management strategies, insulation alternatives and advanced foundation alternatives will be explored.</p> <p>1. Foundation Design and Construction from the Basics to Advanced</p> <ul style="list-style-type: none"> • Basements • Crawl Spaces • Slabs • Insulated Concrete Forms 	<p>20 min.</p>
<p><u>Mechanical Systems - Conditioning the Indoors</u></p> <p>This segment provides participants with important information about properly sizing and selecting heating, cooling, ventilation and hot water heating systems. With better envelope insulation and air sealing and better windows, furnaces and AC units can get smaller. Equipment options and advancements will be shown that will allow builders to optimize</p>	

<p>system performance at potentially lower overall costs. Understanding the basics of HVAC design can lower utility bills, make for quieter, healthier and more comfortable homes.</p>	
<p>1. Combustion Safety</p> <ul style="list-style-type: none"> • Direct Vent Furnaces & fireplaces • Power Vent Water Heaters • Tankless Water Heaters 	10 min
<p>2. Right Sizing of HVAC systems</p> <ul style="list-style-type: none"> • Heat Loss / Gain and Comfort Factors and who can do proper sizing • Providing HVAC contractors with good information • The benefits of avoiding over sizing 	20 min
<p>3. High performance heating & cooling system features</p> <ul style="list-style-type: none"> • ECM Fan Motors • Heat pumps 	10 min
<p>4. Distribution systems</p> <ul style="list-style-type: none"> • Sizing & installing properly • Keeping ducts in conditioned spaces • Conditioned attics 	10 min
<p>5. Verify Performance</p> <ul style="list-style-type: none"> • Air tightness, duct leakage and thermographics 	5 min
<p><u>Indoor Air Quality & Other Mechanical Opportunities</u> This segment covers all aspects of the ever more important topic of indoor air quality. Participants will learn the basics of mold and other pollutant sources and cost effective strategies to solve indoor air quality concerns and how they will be able to offer healthier indoor environments for their customers. In addition, this segment will cover other mechanical systems that can impact comfort, water use and electrical consumption</p>	
<p>1. Indoor air quality introduction</p> <ul style="list-style-type: none"> • Changes that impacts IAQ • Who is affected? • Pollutant Sources • IAQ Control Strategies <ul style="list-style-type: none"> ○ Remove, seal, ventilate, filter • Radon Control 	20 min
<p>2. Mechanical Ventilation</p> <ul style="list-style-type: none"> • How Much Ventilation? • Types of Mechanical Ventilation <ul style="list-style-type: none"> ○ Exhaust Only Ventilation ○ Supply Only Ventilation ○ Balanced ventilation with heat or energy recovery 	20 min
<p>3. Other Mechanical Opportunities</p> <ul style="list-style-type: none"> • ENERGY STAR appliances and how they can make a big difference • Lighting • In-home water use • Alternates to Traditional HVAC - High Performance Dehumidification, Solar 	15 min

<p><u>The Case for Green Building</u> This segment will show how building science principles fit into the growing trend toward green building. Participants will learn that the same measures taken to improve energy efficiency and building durability are recognized by the leading green building programs.</p> <p>1. Applying Building Science to Green Building Programs</p> <ul style="list-style-type: none"> • Green Building Programs • Engineered and sustainable building products • Construction waste reduction 	10 min
<p><u>Changing the Building Process</u> This segment of the Houses That Work program will show participants how to take advantage of building science principles to find more cost effective methods of building – including alternative building systems. Success stories of builders who have implemented building science will be reviewed.</p> <p>1. Changing the Building Process</p> <ul style="list-style-type: none"> • Who will be responsible for change • Who needs training • Creating a plan to move forward 	15 min
<p><u>Marketing for Performance</u> This final segment will focus on improving the marketing position for innovative builders. Case studies will be shown and available marketing support resources will be reviewed.</p> <p>1. Marketing Tips for Innovative Builders</p> <ul style="list-style-type: none"> • Opportunities for Differentiation • The Bottom Line – cost effectiveness • The Energy Investment Opportunity • The Real Cost of Home Ownership • A Review of National Programs 	15 min.
<p>End of Workshop</p>	