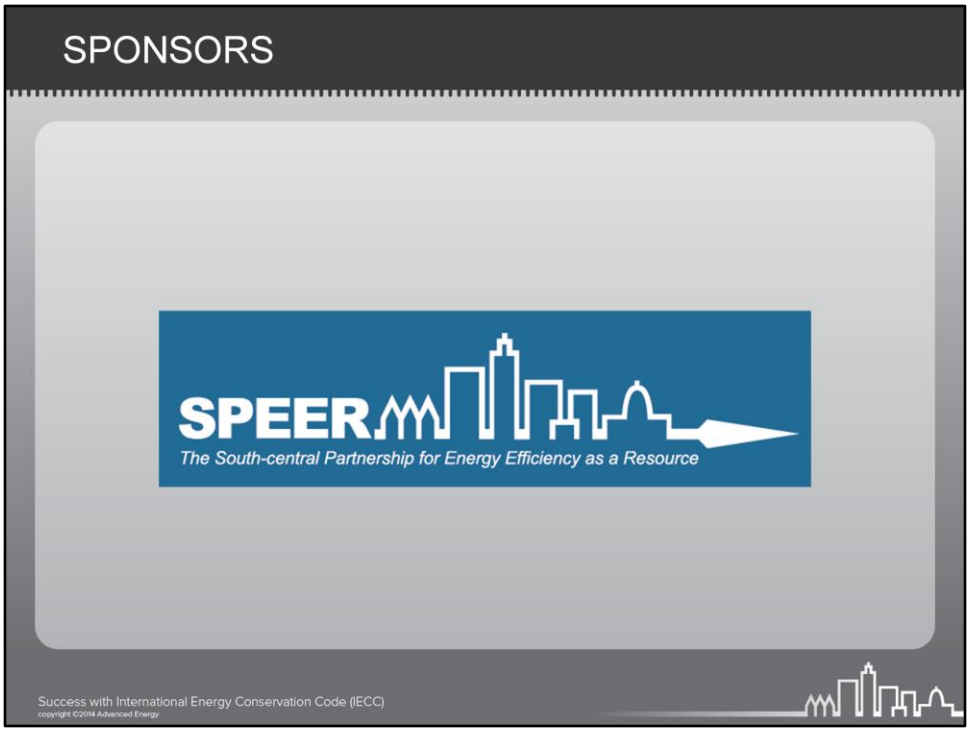
This is a cover slide to display as people gather for the training. Feel free to add your name, the date and class location if you like. But there is a trainer slide in the text sharing the trainer's information.

Narrative: Welcome to this SUCCESS with International Energy Conservation Code class. The SUCCESS with IECC class focuses on the requirements and desired outcomes of the energy code from the perspective of professionals – builders, trades, engineers and code officials – working to implement the code out in the field. The SUCCESS class places a focus on applied building science concepts and proven construction techniques that assist in achieving code compliance while delivering a home that is healthy, safe, comfortable, durable, energy efficient and affordable to own and operate.

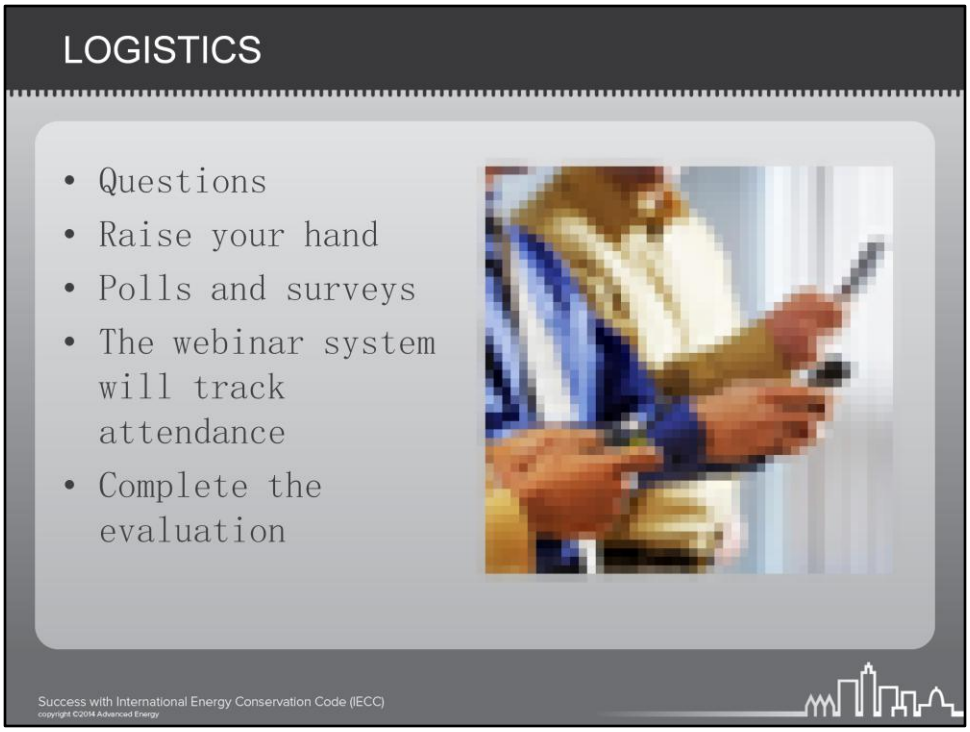
Today's session will focus on insulation and window details that, when done correctly, will assist builders in meeting the code. The 2009 IECC and 2012 IECC have established standards that will save 15% and 30% energy, respectively, against a baseline 2006 IECC home. The 2015 IECC will increase this combined savings by approximately 1% more. Part of this savings is achieved through more stringent fenestration and insulation requirements.

But the details must be done right. In this class we will describe products, installation methods and design details that are necessary to meet the thermal performance standards of both the 2009 and 2012/15 IECC. We will spend a some time walking through critical details necessary to achieve compliance with the code, looking at pictures and answering participant questions and concerns.



Narrative:
The Success With Energy Codes series of presentations was developed by SPEER, the South-central Partnership for Energy Efficiency as a Resource and Advanced Energy. SPEER is the REEO (Regional Energy Efficiency Organization) representing Texas and Oklahoma. It is a member based not for profit working with the private sector, other not for profits, and government agencies to promote energy efficiency and clean energy through education and outreach. One primary area of concern for SPEER is energy code compliance in Texas and Oklahoma, this presentation is one of the tools we are using to educate the building industry about energy codes and code compliance.

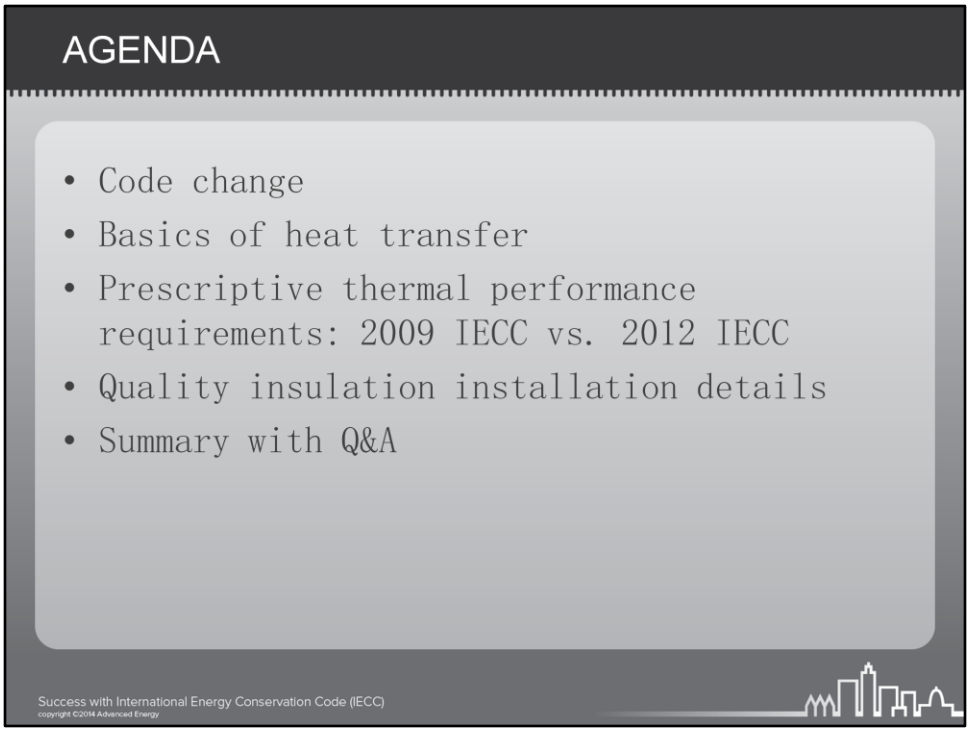
Point of Slide: Provide background on who developed these materials and the wide range of experience and knowledge leveraged to create the slides and book.



Narrative: Let's take a moment to cover some logistics for the day:
If this is being presented as a webinar, use the slides above. If it is an in person presentation you will have to cover the logistics below.

- Share with the group where bathrooms are located
- Ask everyone to either turn off their cell phones or put their cell phones on vibrate
- Make sure everyone signs in and signs out as necessary (for either continuing education units or for internal reporting purposes)
- Clarify that there will be an evaluation that you would like everyone to complete at the end of the session
- *Be sure to mention breaks if you will be taking any*
- *Be sure to mention the time and location of breakfast or lunch if you are providing one or both.*

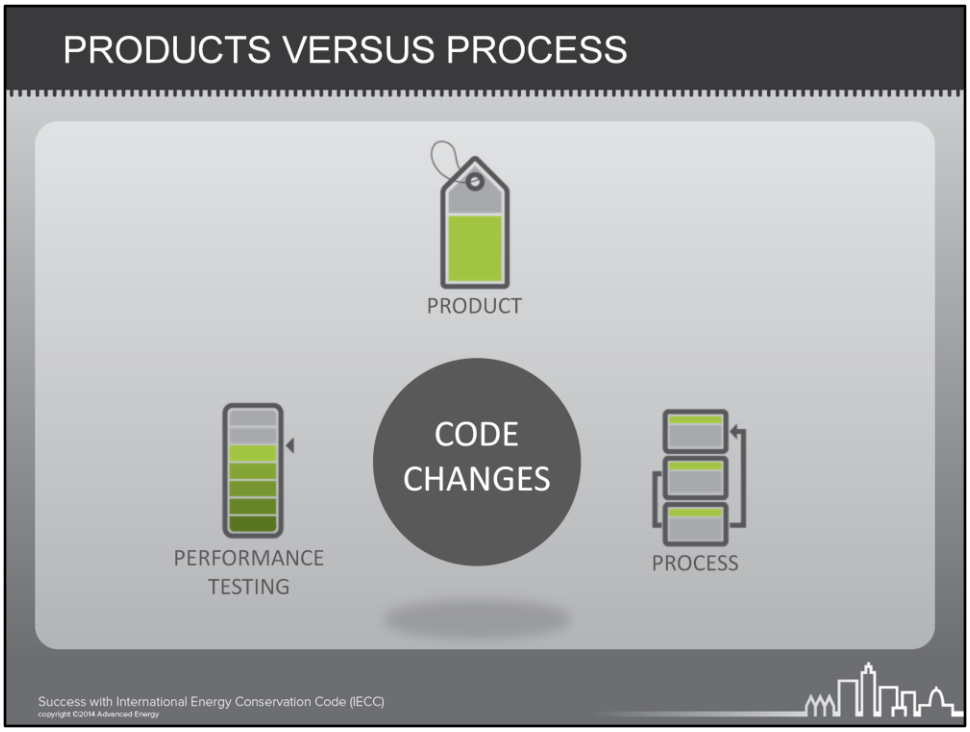
Point of Slide: Establishing logistics puts people at ease and helps the class run smoother.



Narrative: This agenda reflects the major topics we will be covering today and the order of the slides:

- We will start with a brief discussion of code changes, with special focus on the importance of having a clear process for meeting new requirements
- Before we get into insulation installation details, we will cover some building science basics related to heat transfer, which will help show why these new insulation and fenestration requirements are so important
- There are some minor differences in the prescriptive insulation and fenestration requirements
- Regardless of how much insulation you are installing, it is critical that we install insulation right so it can perform as rated and designed
- We will close with some summary of the days details and leave time for any final questions that we didn't answer during the session

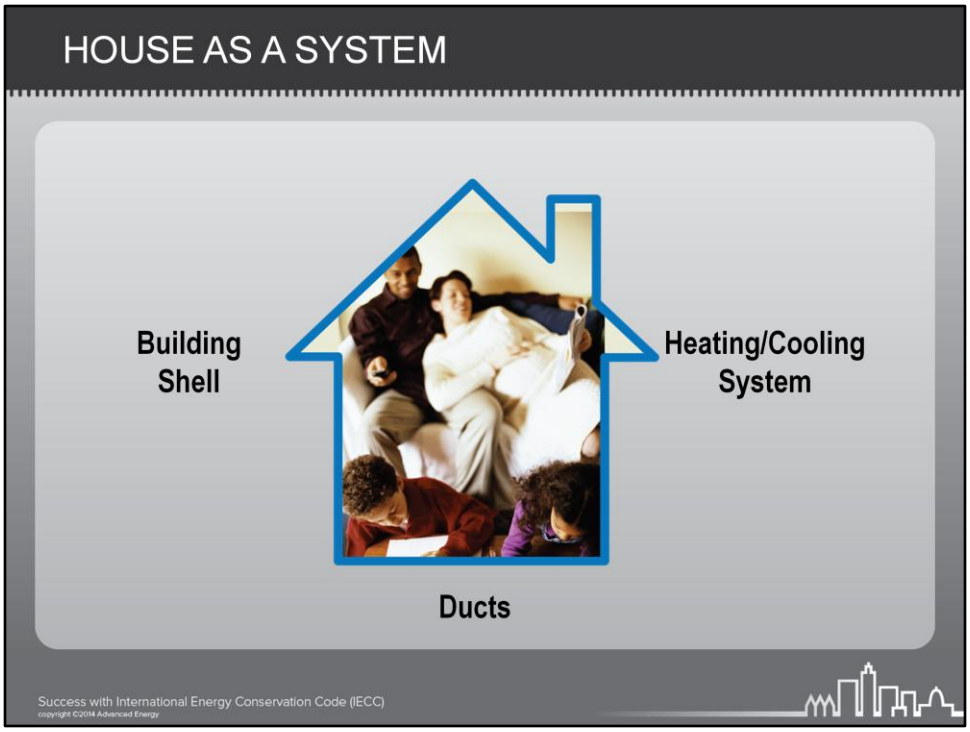
Point of Slide: This agenda describes the main sections of the training. It tells folks what they will learn, helps prepare them and allows them an opportunity to establish some initial questions.



This is an animated slide. Please be sure to note the order of the animation.

Narrative: The application of the code involves the products required, the process to install them and how they might be tested to ensure they work properly. The 2009 IECC was the first national energy code to set standards for field inspections and performance testing. The 2012 and '15 go into more detail on field inspection requirements and more stringent performance testing targets. But regardless of the individual code, all of the code requirements work together to increase the performance of the house, and all fall into one of these categories, Product, Process or Performance Testing.

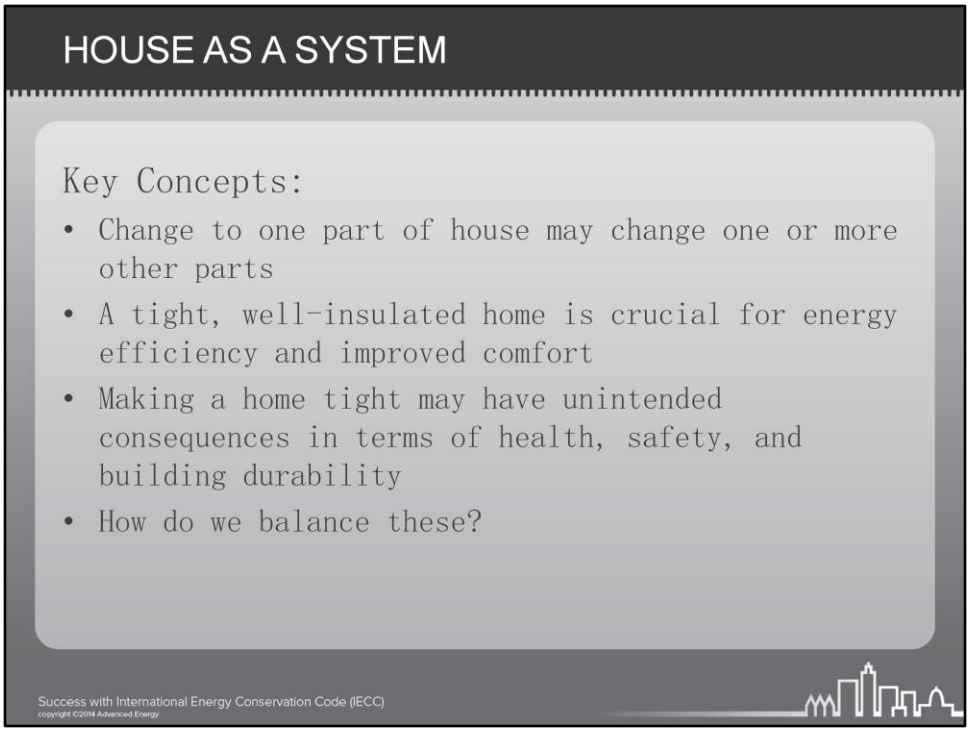
Point of Slide: It is important to understand the differences between code requirements, because they each have their own challenges and obstacles.



This is an animated slide. Please be sure to note the order of the animation.

Narrative: The new codes take a comprehensive systems approach to energy savings. One way to think about a house is that it consists of the building shell, mechanical systems, and an air distribution system. Each of these interact with the others, <u>and</u> with the people in the house. Change one of them, and it will have an impact on one or more of the others and on the people.

Point of Slide: Systems thinking is critical to implementing the codes effectively and efficiently. By doing so we won't compromise the quality of life of the people living in the home.



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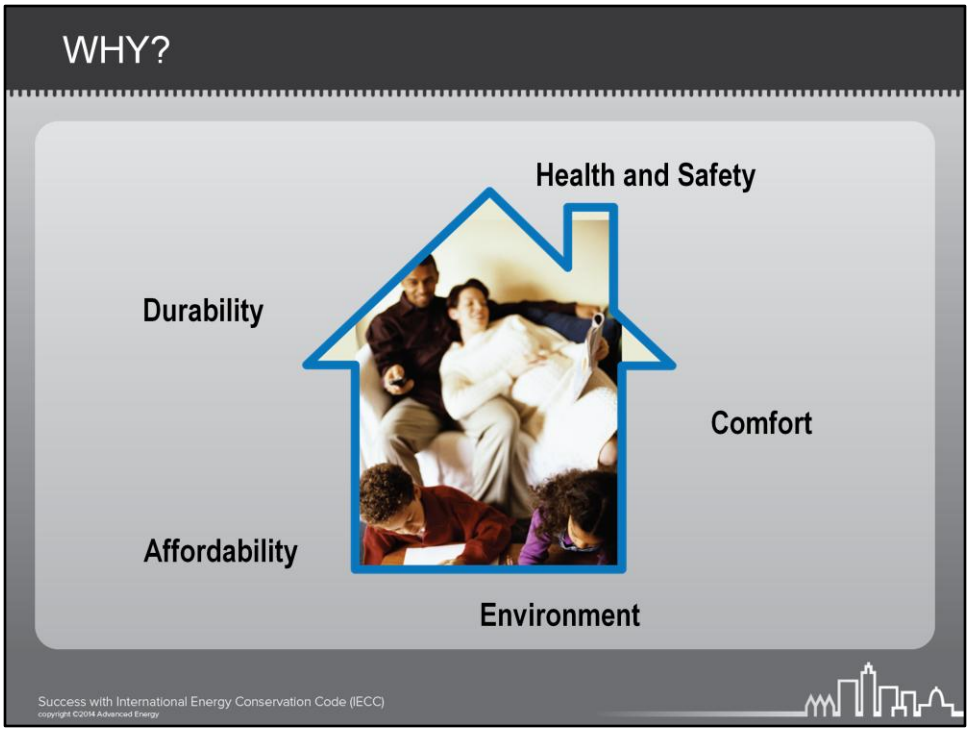
Narrative: In building science, we always think of our house as a system. It is important that we consider all the above points as we make changes to a home. If we only concentrate on energy efficient materials or performance testing standards without considering the potential impacts on indoor air quality or durability, we can do harm to both the building and the occupants!

Point of Slide: Always be aware that changes to a part of a home can affect the whole home as a system.



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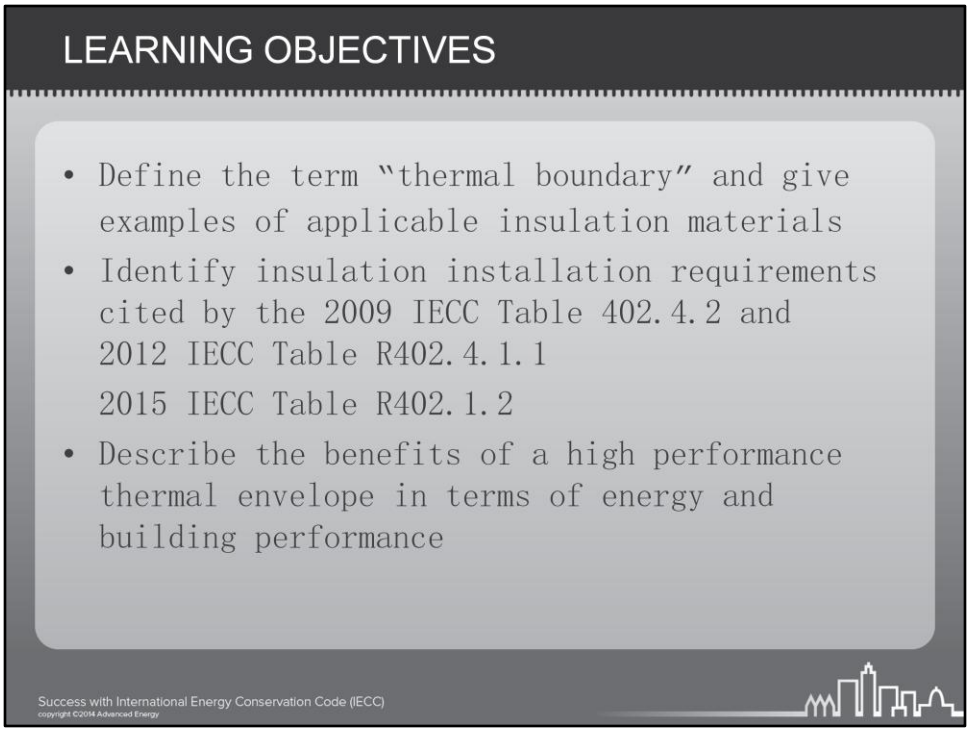
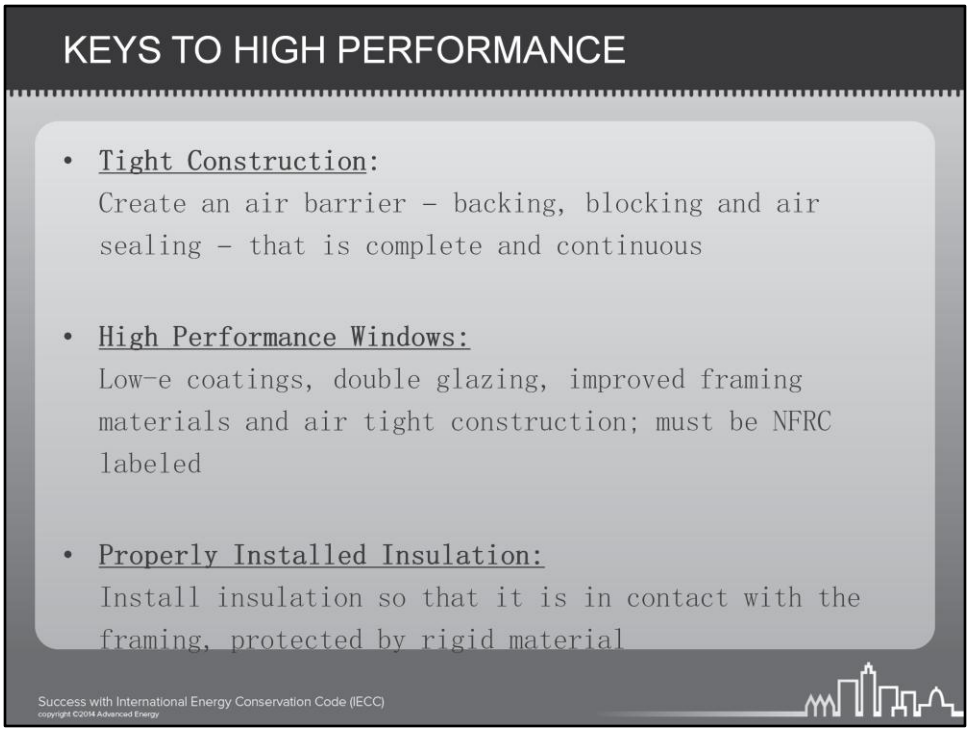
Narrative:
The ultimate point of the house as a system concept is to create a better home for the families living in them. Houses built to the new code are much better than houses built 10-20 years ago, not only because they are more energy efficient (click to animate text), but because they are more durable, comfortable and healthier for occupants. The 2009, 2012, and '15 IECC have incorporated specific insulation installation requirements because they were written with a systems approach (Click to animate image).

Point of Slide:
All of these factors are constantly interacting with each other and with the people. If we do something to impact one of these, we will most likely also impact other factors.



Narrative: A couple of points about these learning objectives: They start with the simplest to achieve and move to the most difficult. In addition, they follow the agenda. You can expect to accomplish the last learning objective at the end of the day. Lastly, these learning objectives provide a way to evaluate the course. By checking for understanding during the presentation, after activities and through the survey, you can gain quick insight if the learning objectives are being met.

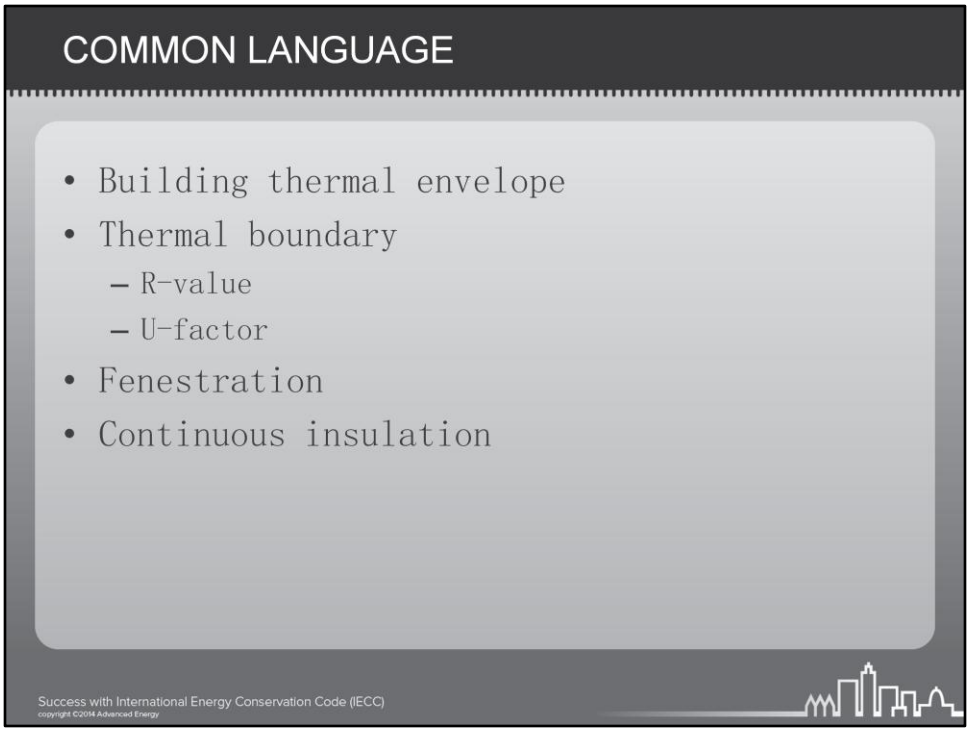
Point of Slide: Learning objectives are what we hope to have all (willing) participants to achieve. It is important to know the participants goals of this training – and they had an opportunity to state them in their introduction when asked about concerns.



Narrative: The first step to establishing a high performance envelope is to build it tight with good air barrier and air sealing details, we covered framing and air barriers in module 2. Once you have created a good air barrier, you install good windows to help manage radiant heat. Then you finish with properly installed insulation…the more the better!

The following slides are going to focus on window requirements and insulation installation details that will lead to properly installed insulation and a thermal boundary that will perform.

Point of Slide: The second and third step to a high performance envelope are good windows and properly installed insulation.



Ideally the instructor can bring samples of insulation materials that can be passed around the room. Examples include small pieces of foam board, pieces of fiberglass or rock wool, insulation installation tools, etc.

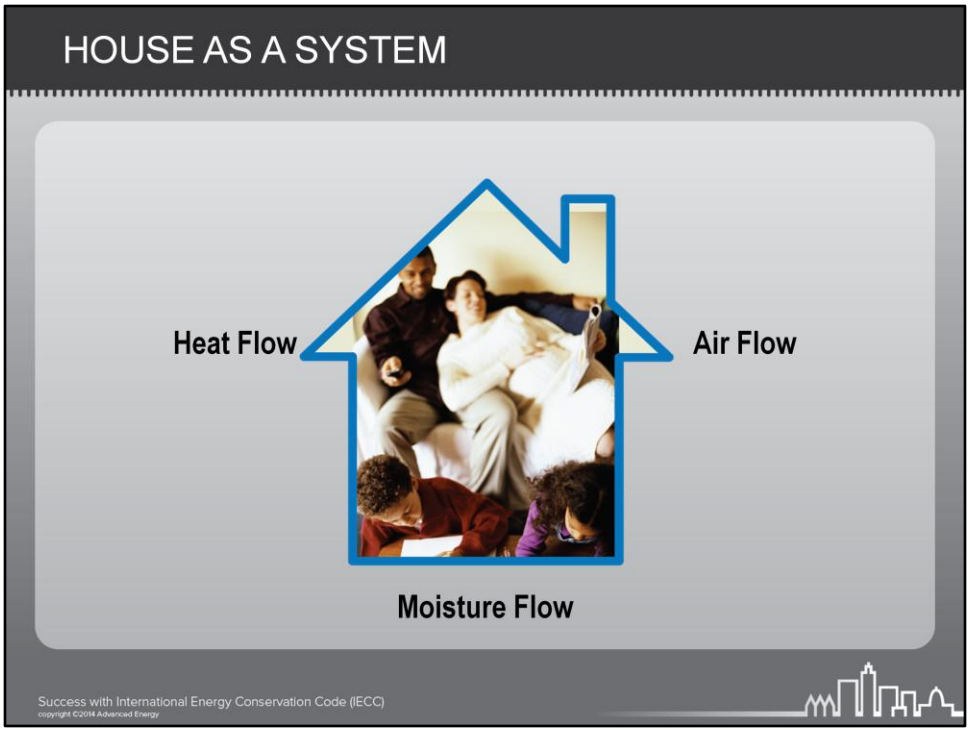
Narrative: Before we get into framing and air sealing details, it is important to establish a common language so we are all using the same terms and you all understand the concepts to be covered.

Ask the class the following questions. Give them a few seconds to answer; if no one answers, ask someone to give a definition:

- "What do we mean by the term building thermal envelope?" There isn't a single answer, but one way to think about the building thermal envelope, which is often referred to as the building envelope, is that it is the part of the house that separates inside from outside. In order for a house to perform well—provide comfort at a reasonable price—it needs to be reasonably air tight and well-insulated.

- "What do we mean by the term thermal boundary?" The layer in a building that is designed to manage the transfer of heat between the conditioned and unconditioned space. It is part of the building envelope and it may or may not align with the air barrier, although for our purposes in standard construction we like to see the thermal boundary and air barrier aligned.

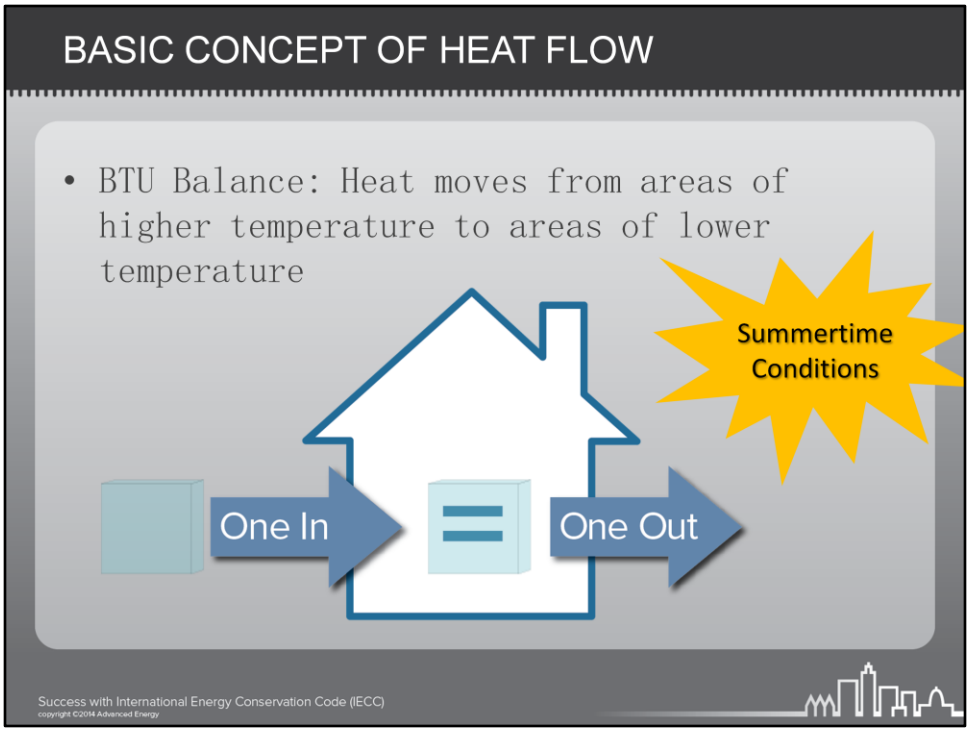
- Ask the class, "What are some examples of materials used to form a thermal boundary?" Some common materials used to form the



This is an animated slide. Please be sure to note the order of the animation.

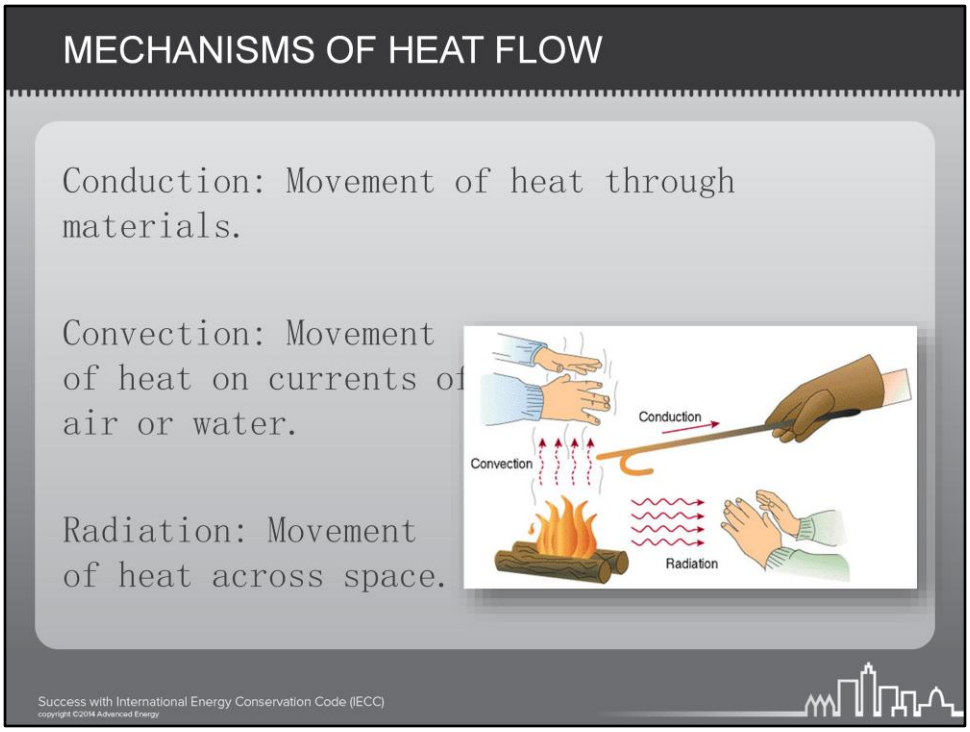
Narrative: Another way to look at a building envelope: (Click to animate text) It's there to control air flow in and out; heat flow in and out; and moisture flow in and out. If we change one of these, it may have an impact on the others, and on the people in the house (Click to animate image).

Point of Slide: New energy codes – and the people designing and constructing buildings – are now doing their best to take a systems approach and manage heat, air and moisture flow. For the next few slides will we focus on the basics of heat flow.



Narrative: When air is heated, it rises. When water is heated, is rises. But heat itself does not rise…necessarily. Heat moves from hot to cold, in whatever direction that happens to be up, down, or sideways. It always flows from where it's hotter to where it's colder, until equilibrium is reached.

Point of Slide: Heat flows from hot to cold. One BTU in = One BTU out (In the winter) and One BTU out = one BTU in (in the summer)



Narrative: There are three primary ways that heat moves into and out of buildings.

1. Conduction – heat moves form molecule to molecule (objects must be touching)
2. Convection – heat moves through a fluid– such as air or water.
3. Radiation – heat moves across empty space, such as the heat from the sun radiating across space to heat up our planet. That heat isn't moving by hot objects touching each other; it is also not dependent on air flow, the heat simply moves through space.

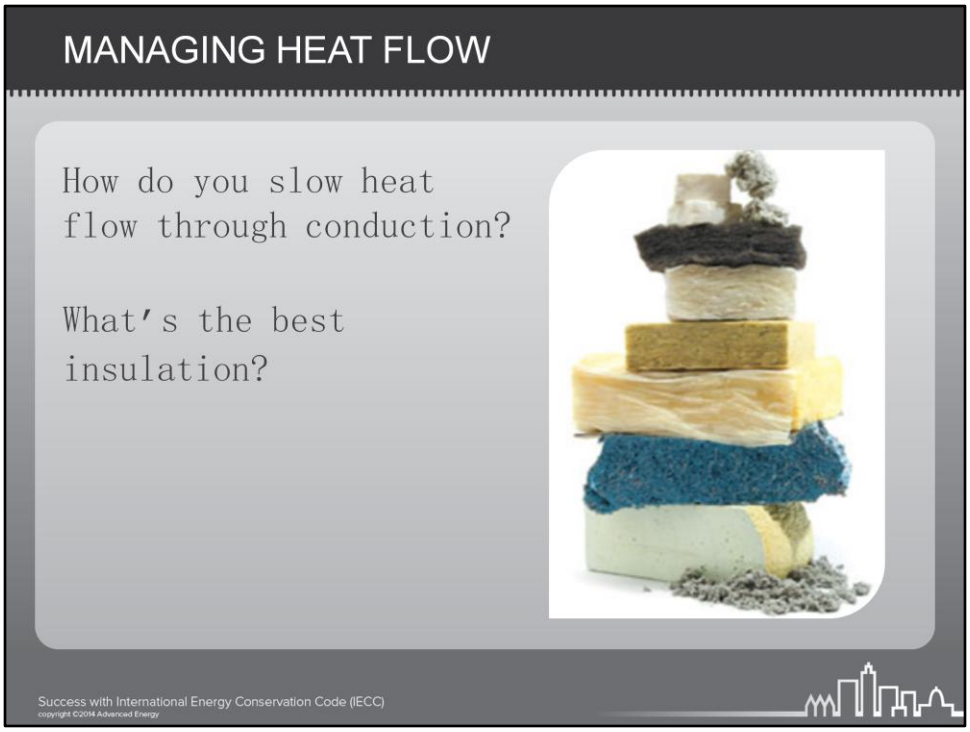
Often, more than one of these is happening at the same time. Think about a hot attic, the underside of the roof sheathing gets hot through _____(conduction). If you are in the attic but not touching the sheathing and there is not air movement, your get hot through _____ (radiation). But when you first opened that attic hatch and the hot air blew out on you, that was _____(convection).

Evaporation – another method of heat transfer – is very important for heat moving out of our bodies, but is not a big factor for heat moving into and out of buildings.

Point of Slide: Heat can be transferred in and out of buildings in multiple ways, so we need to take a systems approach when managing heat flow and consider the three primary heat flow methods: conduction, convection and radiation.

<u>OPTIONAL Heat Flow Demonstration</u>

Materials Needed:



This is an animated slide. Please be sure to note the order of the animation.

Narrative: Ask the question, "How do you slow heat flow that occurs through conduction?" The simple answer is introduce materials with more thermal resistance. In other words, install insulation - the greater the R-value the better.

Ask the question, "What's the best insulation?" Give them a few seconds to answer until someone gives you the correct answer, "The insulation that you can get installed correctly." That's right! It is not so much the type of insulation you choose to use, but how it is installed. Different products have different advantages and disadvantages, but the most important factor in performance is how well it's installed.

Point of Slide: The performance of insulation is usually determined by the installation more than the type. It is critical to get it installed correctly to not only perform but to meet the requirements of the 2009 and 2012 IECC

Narrative: This is a photo from the July 2006 issue of Newsweek. This is a picture of a well-intentioned actor renovating his Brooklyn, New York apartment, and wanting to be "green." The focus on the entire issue was green. Look at this denim insulation. Great stuff right? 100% recycled. Good R-value. No harmful glues or formaldehyde used.

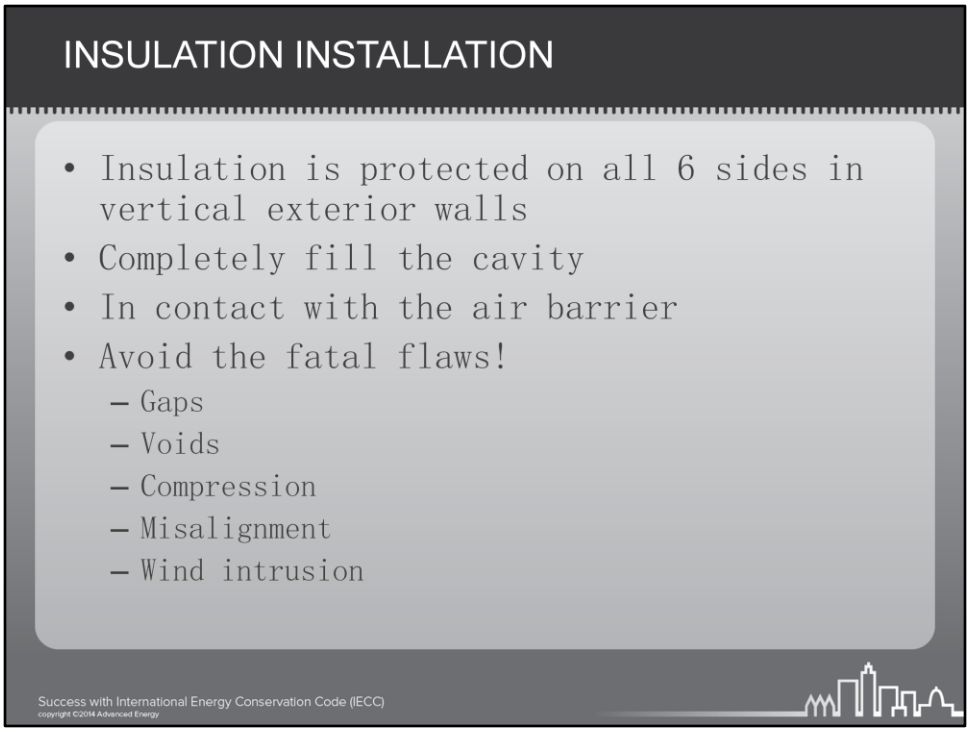
Ask the class, "This is a great example of a green product, right?" Give them a few seconds to answer.

Point of Slide: Simply show the slide and gather reactions from the audience about Green products and Green homes. Then the next slide should show the real importance of performance vs. material content.

Narrative: Agree with them that this is a green product…when it is sitting on a shelf. But as it has been applied in this situation, we see installation flaws everywhere. The insulation, and therefore the wall, will not perform to its full potential.

Can we call it "green" if it's not going to manage heat flow as well? Is a product green or energy efficient independent of its installation?

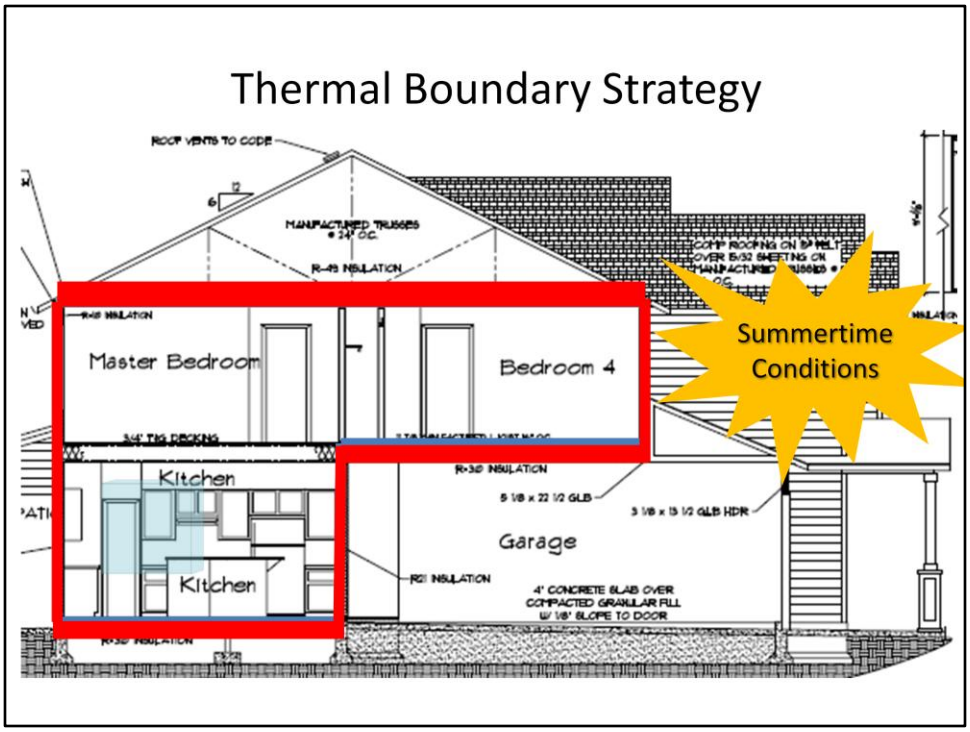
Point of Slide: Just because something is labeled "green" doesn't mean it will really improve the environment or deliver all of the great benefits it claims. With energy efficiency, there are no silver bullets. As we discussed earlier, the house is a system made up of many different parts, and they all must be designed and installed with performance and their interactions in mind.



Narrative: Here is a list of the general requirements for properly installed insulation:

- As we covered in the previous module, framing protects insulation so it can do its job. All vertical walls should be 6 sided, with the exception of rim joists and other areas between floors; this means backing of knee walls, backing behind tubs, showers and fireplaces.
- The primary rule of insulation is that insulation must be installed to manufacturer's specifications.
- Next, fill the entire cavity. Top to bottom, side to side and full depth.
- Compression should be avoided in walls and ceiling, but a little compression under floors is acceptable in order to support the insulation and maintain contact with the floor
- Avoid the fatal flaws! These are details that reduce effective R-value and create hot and cold surfaces; all of which lead to comfort issues and extra energy use

Point of Slide: The thermal boundary involves multiple components, and in order to work as designed those parts need to be properly installed according to the standards established by the 2009 IECC and 2012 IECC



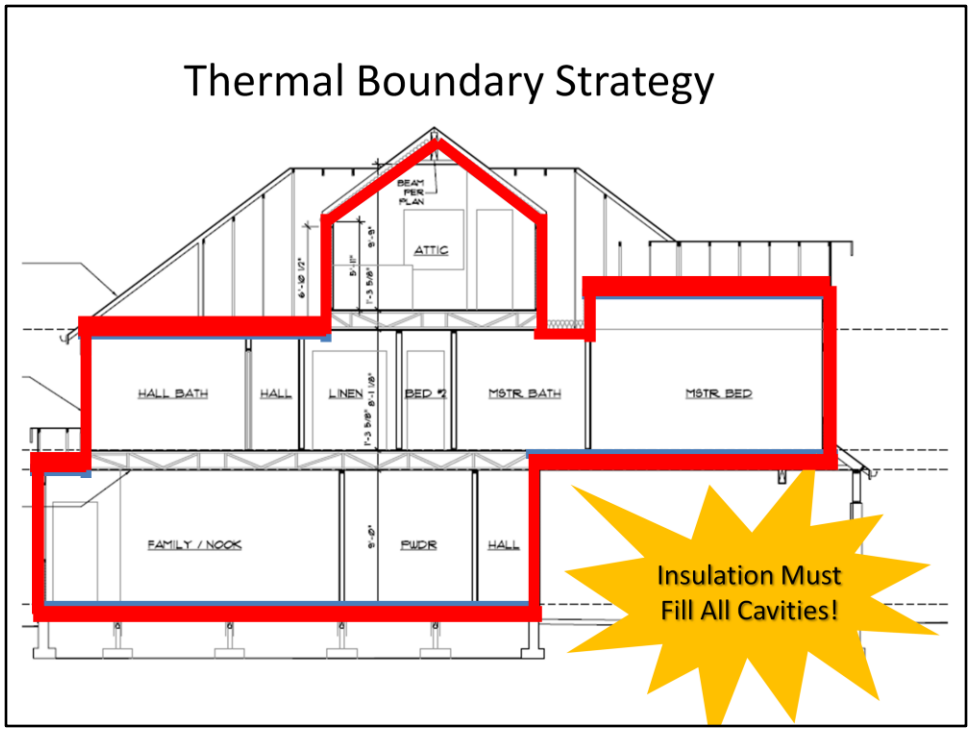
This is an animated slide. Please be sure to note the order of the animation.

Narrative: This animated slide highlights the air barrier and thermal boundary on a set of plans; it clearly defines the separation between conditioned and unconditioned space and allows us to locate critical framing and insulation details in the planning stage. By drawing the thermal boundary along with the air barrier on a set of plans, it simplifies the conversation and makes the insulation details clear to everyone because every house has a set of plans, and all of the critical trades – framer, electrician, plumber, HVAC contractor and insulator – have installation requirements called out in the plan.

Before starting the animation, remind the class that this is the same section view they saw earlier from a set of plans for a two-story home with an attached garage. Now animate the blue air barrier and ask them to visualize the thermal boundary (i.e. the insulation layer) and its location relative to the air barrier. Give them 10-20 seconds to visualize the thermal boundary, then start the animation with a single click and allow it to outline the red thermal boundary. Do not click the mouse or presentation remote again as this will fast forward to the completed outline. Note how the red line aligns with the air barrier and is continuous across the foundation, walls and ceiling.

Point out that while this floor plan is fairly simple (it has no vaults, trey ceilings or knee walls) and consists of stacked boxes, special attention must be paid to the insulation at the garage sub-floor, in-between floors and roof eaves. Later in the class we will discuss these items in more detail.

Point of Slide: Drawing the thermal boundary on a set of plans is a simple first step for showing attendees what we mean by aligning the insulation with the air barrier and creating a thermal boundary that is clearly defined, continuous and complete.



This is an animated slide. Please be sure to note the order of the animation.

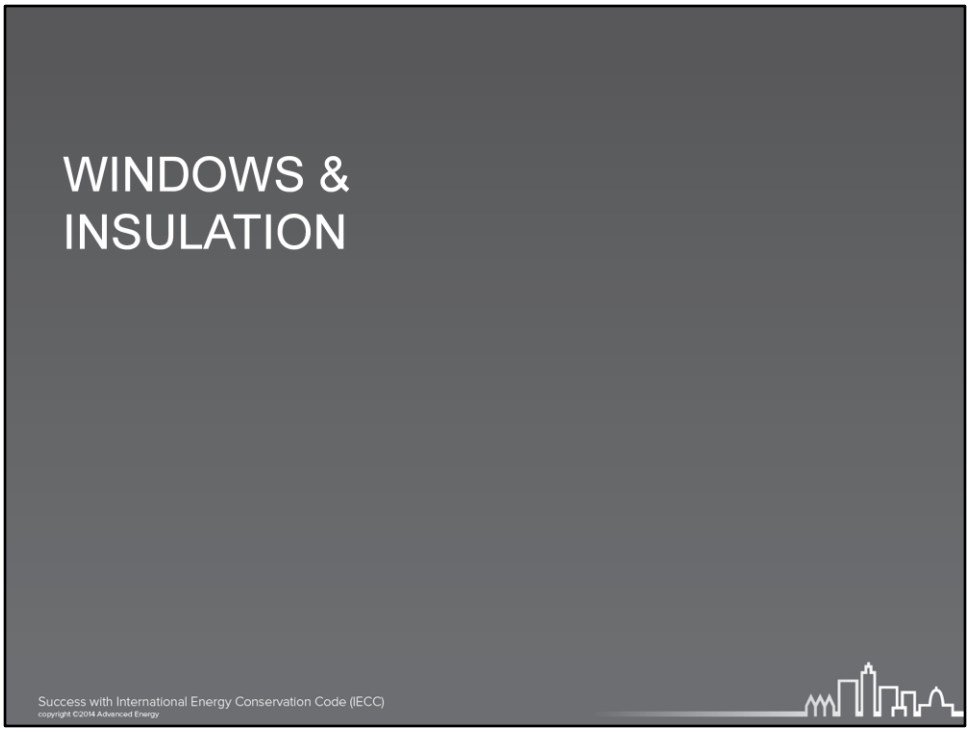
Narrative: Before starting the animation, again remind the class that this is the same section view they saw earlier of a two-story home with an attached garage and bonus room that includes some more challenging details.

Now animate the blue air barrier and ask the attendees to visualize the thermal boundary (i.e. the insulation layer) and outline it on plans on the screen with their minds eye. Give them 10-20 seconds to visualize the thermal boundary, then start the animation with a single click and allow it to outline the thermal boundary. Do not click the mouse or presentation remote again as this will fast forward to the completed outline. Note how the red line aligns with the air barrier and is continuous across the foundation, walls and ceiling.

Point out that this home design is more complicated as it has specific insulation installation details that must be addressed:

- Roof eaves with limited overhangs
- A finished attic with vaulted insulation
- Knee wall access that will need to be insulated and weather stripped
- Insulation between floors
- Two level attic adjacent to master bedroom
- A master bedroom over a garage

Point of Slide: Drawing the thermal boundary on a set of plans is a simple first step for showing attendees what we mean by aligning the insulation with the air barrier and creating a thermal boundary that is clearly defined, continuous and complete. Achieving good insulation installation details is a requirement of the 2009 IECC and 2012 IECC, and it is essential to providing comfort, indoor air quality, energy efficiency and durability to the homeowner.



Narrative: This is just a transition slide indicating we are getting into the window and insulation details.

Point of Slide: Prep the class for what is ahead.

COMPARING PRESCRIPTIVE WINDOW & INSULATION REQUIREMENTS

	2009 IECC Climate Zone 2	2012/15 IECC Climate Zone 2	2009 IECC Climate Zone 3	2012/15 IECC Climate Zone 3
Ceiling	R-30	R-38	R-30	R-38
Above Grade Walls	R-13	R-13	R-13	R-20 or R-13+5 C.I.
Basement Walls	N/A	N/A	R-5 C.I. or R-13	R-5 C.I. or R-13
Floors	R-13	R-13	R-19	R-19
Slab	N/A	N/A	N/A	N/A
Window & Door U-Factor	U-0.65	U-0.40	U-0.50	U-0.35
Window & Door SHGC	SHGC 0.30	SHGC 0.25	SHGC 0.30	SHGC 0.25
Hot Water Pipe Insulation	N/A	R-3	N/A	R-3

Success with International Energy Conservation Code (IECC)

Narrative: This slide highlights the prescriptive window and insulation requirements established by both the 2009 IECC and 2012/15 IECC for climate zones 2 and 3. Climate Zone 4 has been excluded to keep the table easier to read, but keep in mind that some jurisdictions in Texas and Oklahoma do fall under Climate Zone 4.

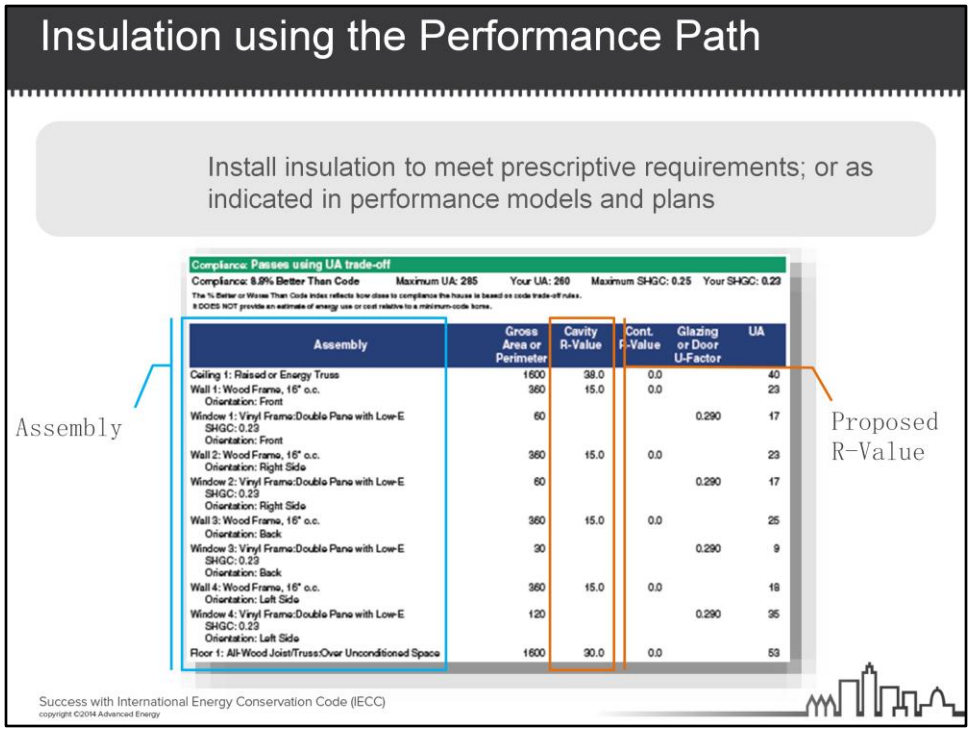
The 2009 and 2012 IECC insulation standards are similar in that they provide guidelines for insulation installation as laid out in tables 402.4.2 and 402.4.1.1, respectively. However, the 2012 IECC establishes slightly more stringent insulation requirements depending on your climate zone.

Ask the class to review the slide and make note of any differences between the 2009 IECC and 2012 IECC prescriptive insulation and fenestration requirements. Give them 30-45 seconds and call on a volunteer.

Do not share these, let the class identify them. But here are a list of the differences on the slide:

- Ceiling insulation levels have gone from R-30 to R-38 in both CZ's 2 and 3
- Window and Door U-Values have become more stringent; U-0.65 to U-0.40 in CZ 2 and U-0.50 to U-0.35 in CZ 3
- Window and Door Solar Heat Gain Coefficients have become more stringent; SHGC 0.30 to SHGC 0.25 in CZ's 2 and 3
- The 2012 IECC requires a minimum R-3 pipe insulation on all domestic hot water pipes

Point of Slide: The 2009 and 2012 IECC each establish clear prescriptive requirements



This is an animated slide. Please be sure to note the order of the animation.

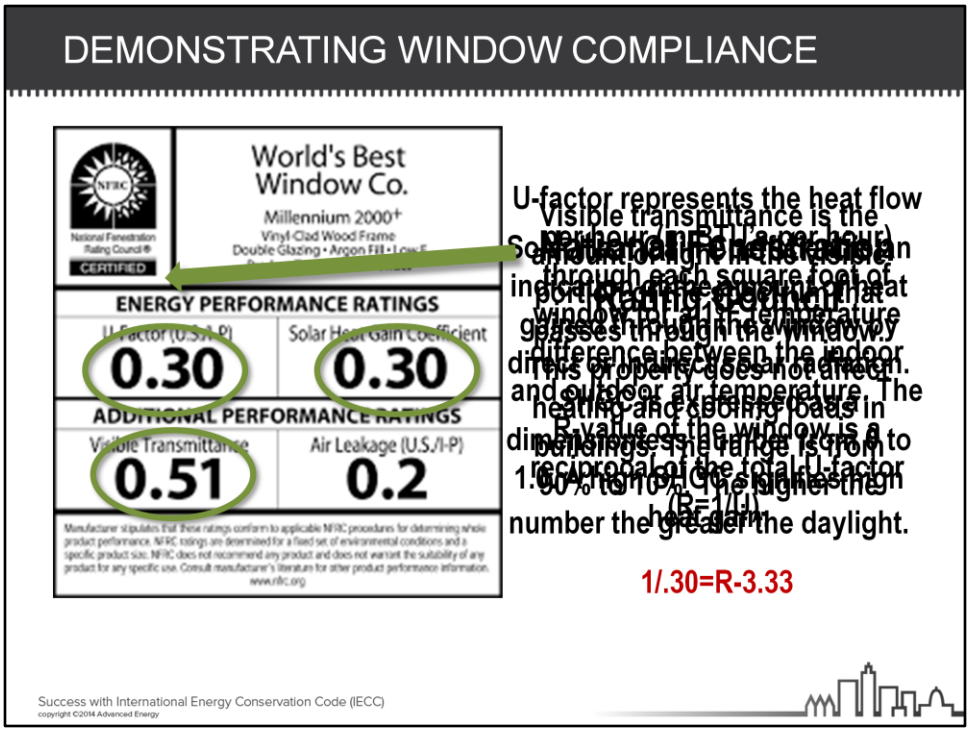
Narrative: Depending on the compliance path being followed by the builder, insulation levels per assembly will need to be documented and displayed in some way.

This is a screen shot of a REScheck compliance report. It indicates that the building meets the total UA and window requirements of the applicable code. REM/Rate, Energy Gauge and other approved modeling software programs also produce similar compliance reports.

Animate first text and callout: It needs to highlight the building assembly (i.e. ceilings, walls, windows and floors).
Animate second text and callout: It also should include the proposed R-value for each assembly.

If not following the performance path, insulation will be expected to meet prescriptive minimum requirements.

Point of Slide: Install insulation to meet prescriptive requirements; or as indicated in performance models and plans



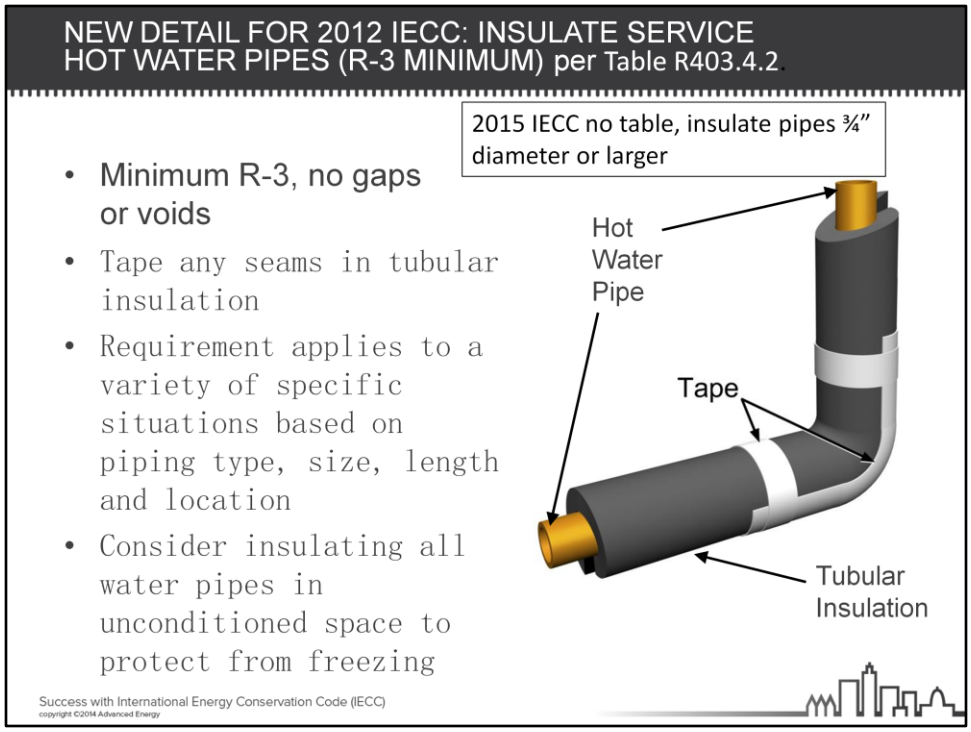
This is an animated slide. Please be sure to note the order of the animation.

Narrative: Most windows carry a rating label.

The explanation for each of the ratings pops up in the slide. As you animate each text explanation, you might want to have a different class member read each one.

Ask the class, does this window meet the prescriptive requirements for Climate Zone 3 of the 2009 IECC? The answer is Yes. But it does not meet the requirements of the 2012. The Solar Heat Gain Coefficient is not low enough.

Point of Slide: This label is critical to demonstrating compliance and must be on the window when you are completing your final walk.



Narrative: A new prescriptive requirement of the 2012 IECC, not addressed by the 2009 IECC, is to insulate all service hot water pipes to a minimum of R-3. The 2015 eliminates Table R403.4.2 and generally simplifies the requirement to all DHW pipes ¾" or larger in nominal diameter. This is a prescriptive requirement not a mandatory so if the home is being built according to the performance or ERI path, pipe insulation may not apply.

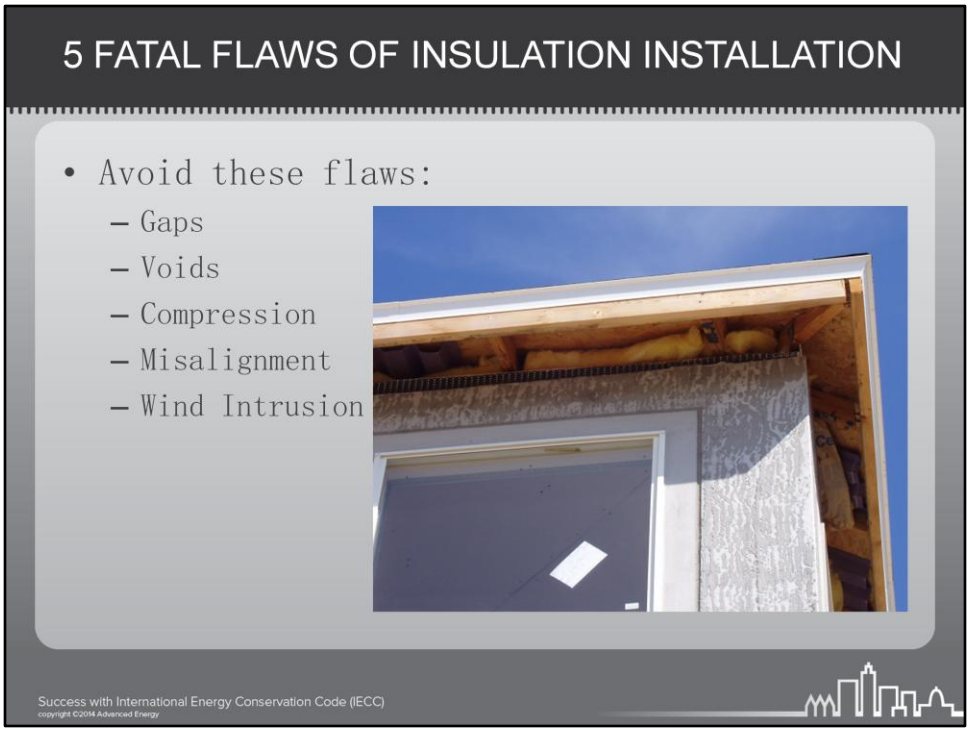
This can be done with a variety of techniques, including tubular insulation, hot water wrap or a vapor barrier faced insulation product. But there shall be no gaps and seams should we taped.

If subject to this requirement, insulation for hot water pipe with a minimum thermal resistance (R-value) of R-3 shall be applied to the following:

1. Piping larger than 3/4 inch nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping from the water heater to kitchen outlets.
4. Piping located outside the conditioned space.
5. Piping from the water heater to a distribution manifold.
6. Piping located under a floor slab.
7. Buried piping.
8. Supply and return piping in recirculation systems other than demand recirculation systems.
9. Piping with run lengths greater than the maximum run lengths for the nominal pipe diameter given in Table R403.4.2.

Insulation Installation Criteria

- Air Barrier and Insulation Installation Criteria
  - 2009 IECC Table 402.4.2
  - 2012 IECC Table 402.4.1.1
  - 2015 IECC Table 402.4.1.1
- Each is slightly different, know which applies



This is an animated slide. Please be sure to note the order of the animation.

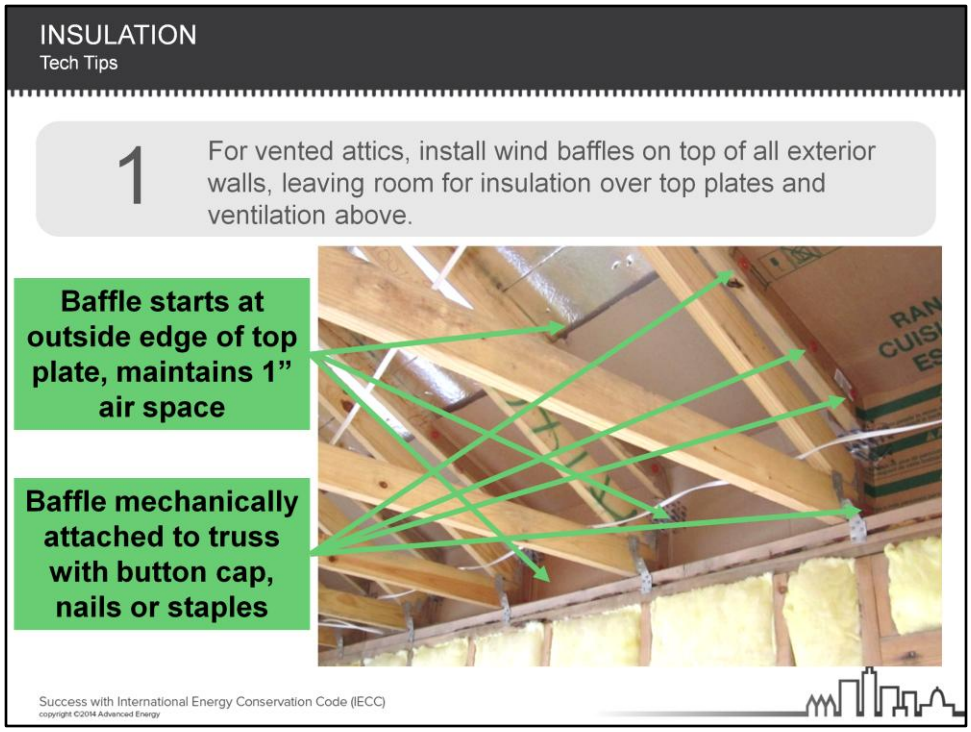
Narrative: For the remainder of the session, we are going to cover the insulation installation issues that reduce R-value, compromise the requirements of the 2009 and 2012 IECC and lead to comfort complaint.

Animate each of the five fatal flaws one-by-one and quickly read them out:

Gaps – Instances where insulation is cut too short
Voids – Sections of missing insulation
Compression – Where insulation has been pushed inside a cavity and does not completely fill the cavity
Misalignment – Where insulation does not touch the surface it is intended to insulate
Wind Intrusion – Insulation locations exposed to wind that can displace, damage or reduce insulations effectiveness

We are going to review each of the installation fatal flaws in more detail over the following slides.

Point of Slide: Avoid these 5 fatal flaws of insulation installation



This is an animated slide. Please be sure to note the order of the animation.

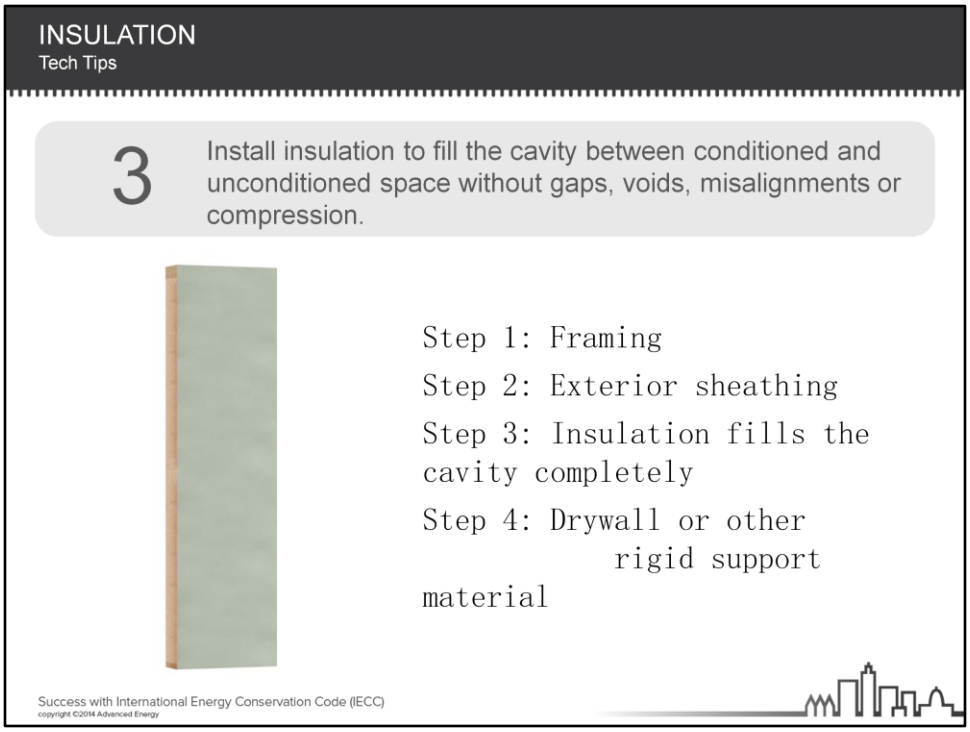
Narrative: Depending on the compliance path being followed by the builder, insulation levels per assembly will need to be documented and displayed in some way.

This is a screen shot of a REScheck compliance report. It indicates that the building meets the total UA and window requirements of the applicable code. REM/Rate, Energy Gauge and other approved modeling software programs also produce similar compliance reports.

Animate first text and callout: It needs to highlight the building assembly (i.e. ceilings, walls, windows and floors).
Animate second text and callout: It also should include the proposed R-value for each assembly.

If not following the performance path, insulation will be expected to meet prescriptive minimum requirements.

Point of Slide: Install insulation to meet prescriptive requirements; or as indicated in performance models and plans



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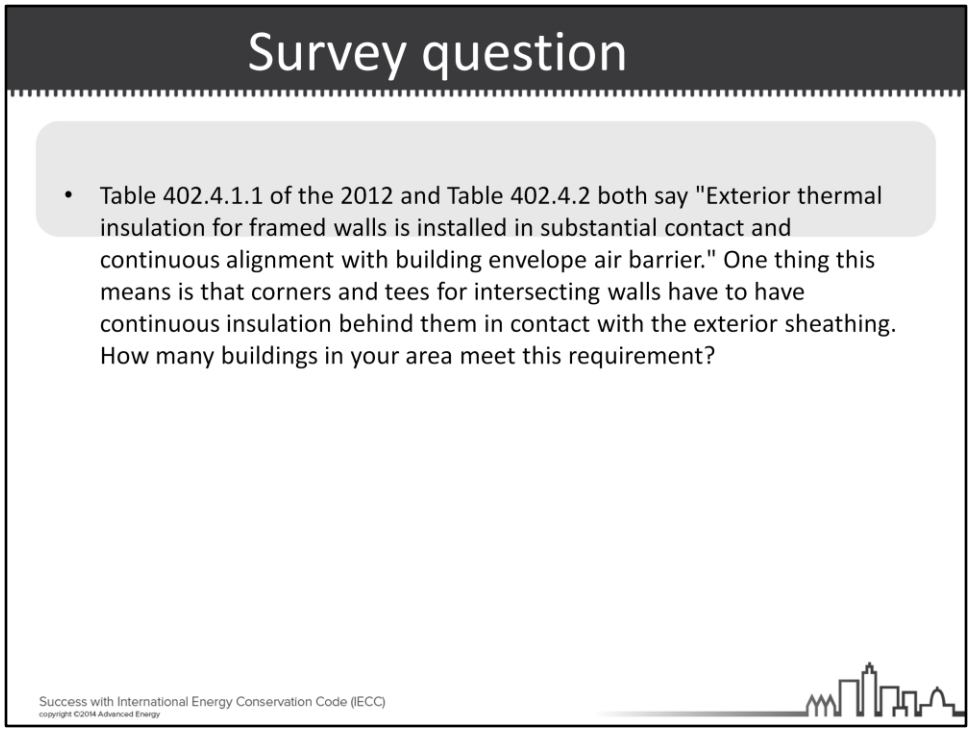

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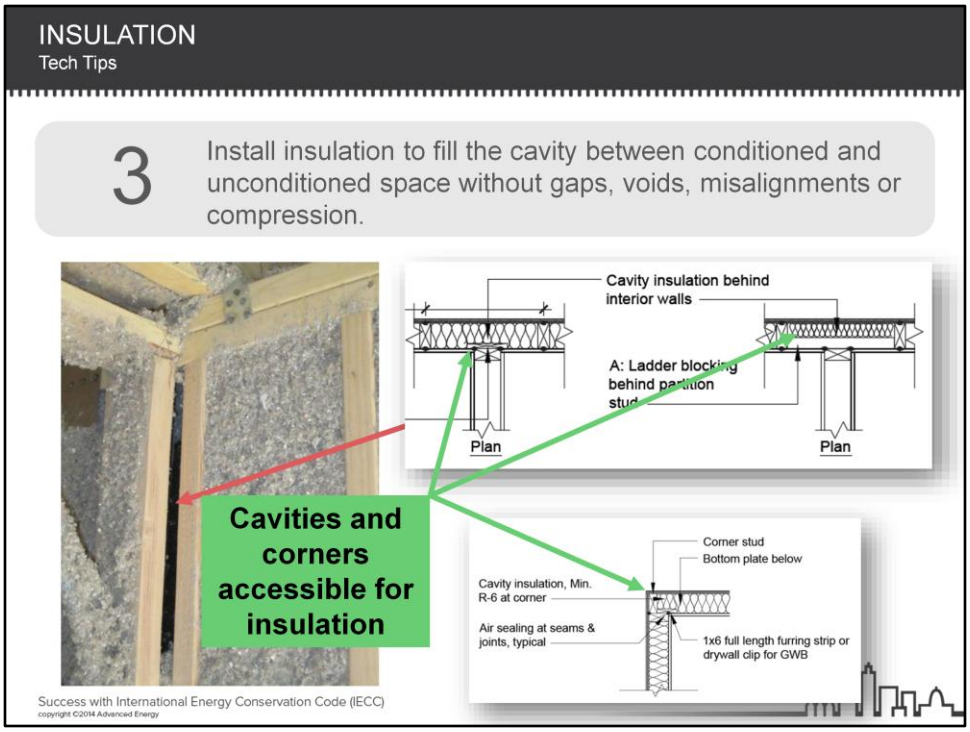


This is an animated slide. Please be sure to note the order of the animation.

Narrative: Give the class a few seconds to look at the image.

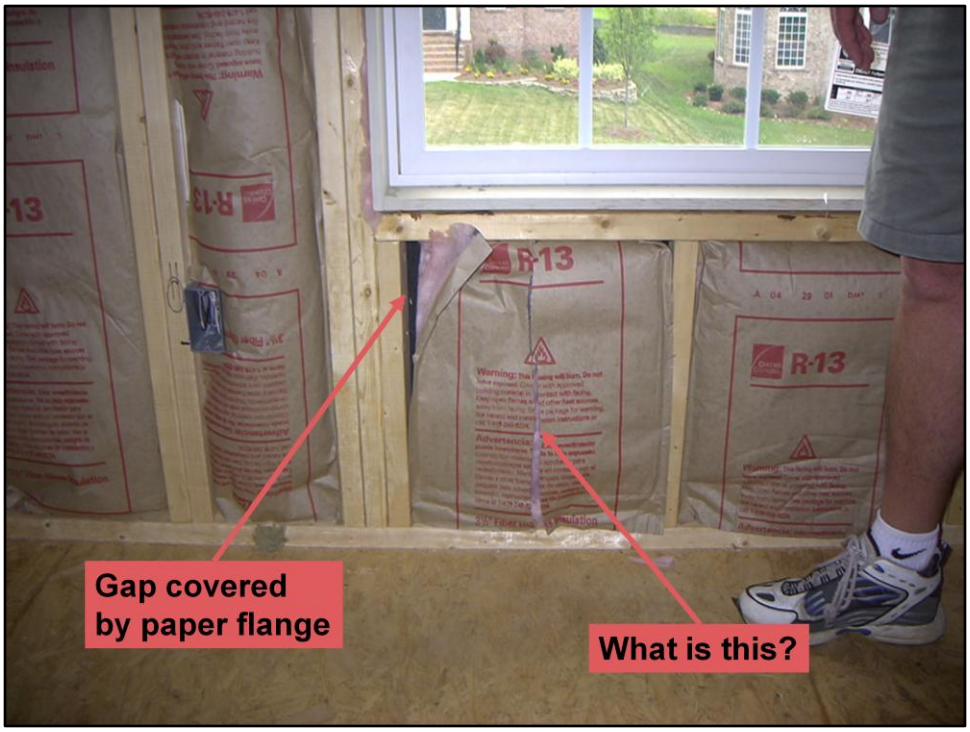
Then animate the first text box and arrow and point out what they are looking at: A void where an interior wall meets the exterior wall.

Animate architectural drawing and text box with arrows. Cavity insulation behind blocking in exterior walls, corners and at interior/exterior intersections must be accessible and filled with insulation. This takes some planning and a discussion with the framer.

Point of Slide: To help meet the intent of IECC Tables 402.4.2 and 402.4.1.1 it is a good idea to put these architectural details in plans and scopes. This will help avoid an inspection failure and save extra trips by the framer and insulator. This is an animated slide. Please be sure to note the order of the animation.

Narrative: Depending on the compliance path being followed by the builder, insulation levels per assembly will need to be documented and displayed in some way.

This is a screen shot of a REScheck compliance report. It indicates that the building meets the total UA and window requirements of the applicable code. REM/Rate, Energy Gauge and other approved modeling software programs also produce similar compliance reports.

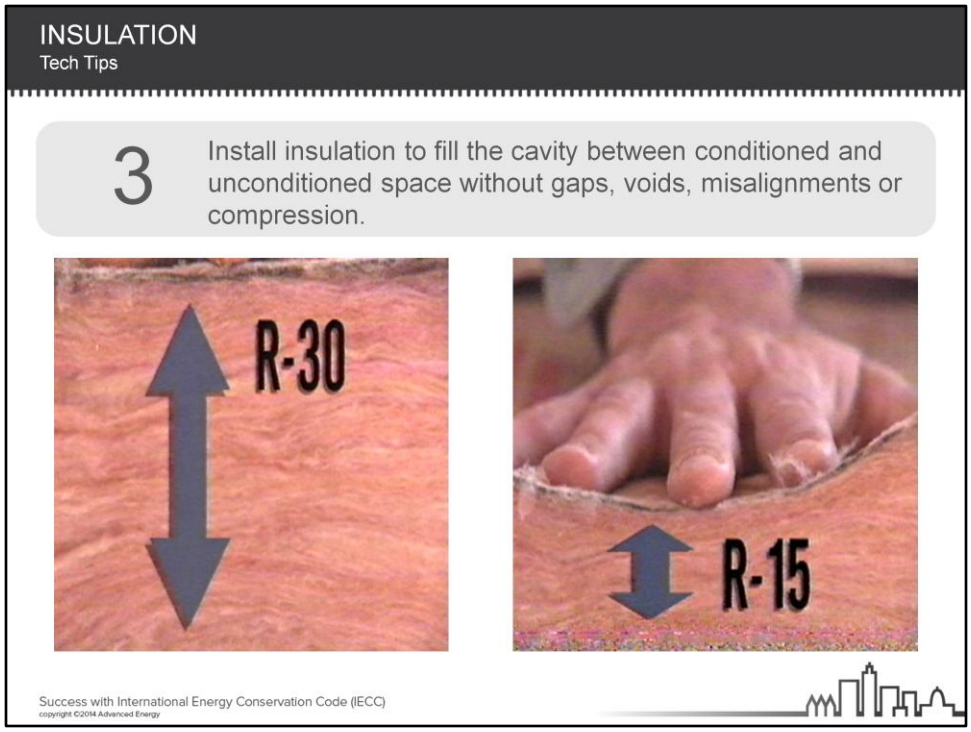


This is an animated slide. Please be sure to note the order of the animation.

Narrative: Give the class a few seconds to look at the image.

Then animate the first text box and arrow and ask the question: “What is this?” The answer: the framer left a cavity too wide for a standard width insulation batt. So instead of cutting two pieces of scrap to fit, the insulator sliced the paper facing and “stretched” it to cover the cavity. Animate second text box and arrow. Unfortunately, there’s about an inch and a half gap, where there is no insulation. This will seriously degrade the thermal performance.

Point of Slide: The insulation needs to fill the cavity. The gap in this picture represents only about 6% of the area of that cavity, but the reduction in R-value will be much, much more than 6%! Probably closer to a 50% reduction in performance.



Narrative: Compressing insulation drastically reduces its performance. For example R-30 compressed halfway yields R-15. Yikes! Talk about an effective R-value killer!

Point of Slide: Compression reduces R-value and minimizing compression is a requirement of the IECC Tables 402.4.2 and 402.4.1.1

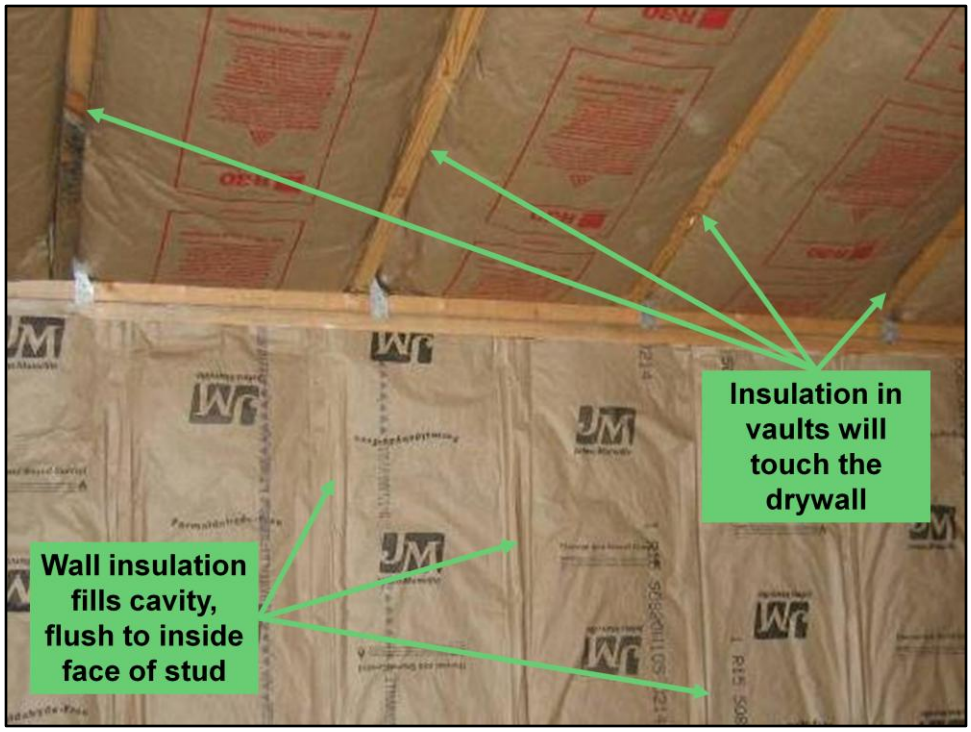
This is an animated slide. Please be sure to note the order of the animation.

Narrative: Give the class a few seconds to look at the image.

This is an image of insulation installed in a sloped ceiling. Animate text box and arrows and it points out where the batts were pushed up into the bays so that it won't be in contact with the sheetrock. There will be a 2-4 inch gap space between the Kraft paper and sheet rock, a classic case of misalignment.

The installers probably used a batt pole or some other makeshift device to place the insulation in the openings. That is fine, but after it is put in place someone needs to come back on stilts, a ladder or scaffolding and adjust the insulation so that the insulation touches the sheetrock and the tabs are on the outer face of the rafters.

Point of Slide: The insulation is misaligned because the batts were intended to insulate the sheet rock, and as such needs to be installed so permanent contact can be made with the sheet rock ceiling.



This is an animated slide. Please be sure to note the order of the animation.

Narrative: Give the class a few seconds to look at the image.

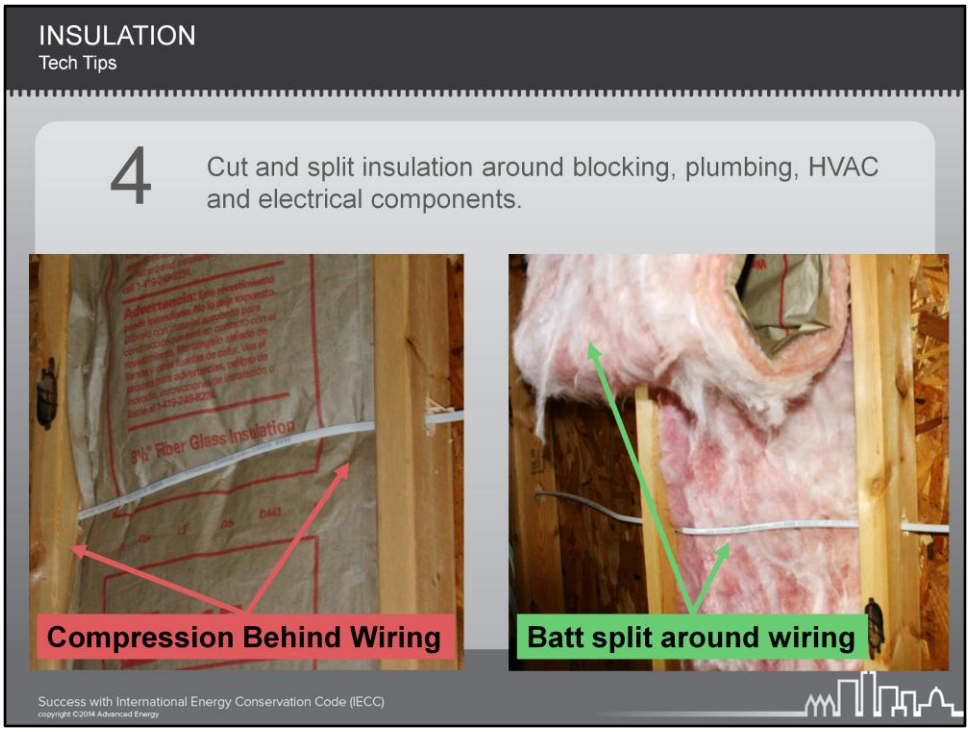
This is a similar image to the last, insulation installed in a sloped ceiling, as well as wall insulation. Animate the first text box and arrows, notice that these batts have been properly installed. The Kraft paper was stapled just at the inside edge of the rafter, but the installers took their time and made sure that the vast majority of the batt is even with the rafters and will maintain contact with the sheetrock.

Animate second text box and arrows. You can see that with the wall insulation, they filled the cavity completely and face stapled the batts so they will be aligned with all sides of the building cavity, including the sheet rock.

Point of Slide: The insulation is properly installed and time was taken to fasten the insulation while making sure permanent contact can be made with the sheet rock ceiling. This install will help meet the intent of IECC Tables 402.4.2 and 402.4.1.1 .

Narrative: Here are unfaced batts installed well. Nicely cut around blocking, they fill the cavity from top to bottom and side to side. There is a little bit of pinching, but not enough to cause any misalignment and no compression. Great job!

Point of Slide: Fiberglass batts, contrary to many claims, can be in installed correctly and meet the intent of IECC Tables 402.4.2 and 402.4.1.1.

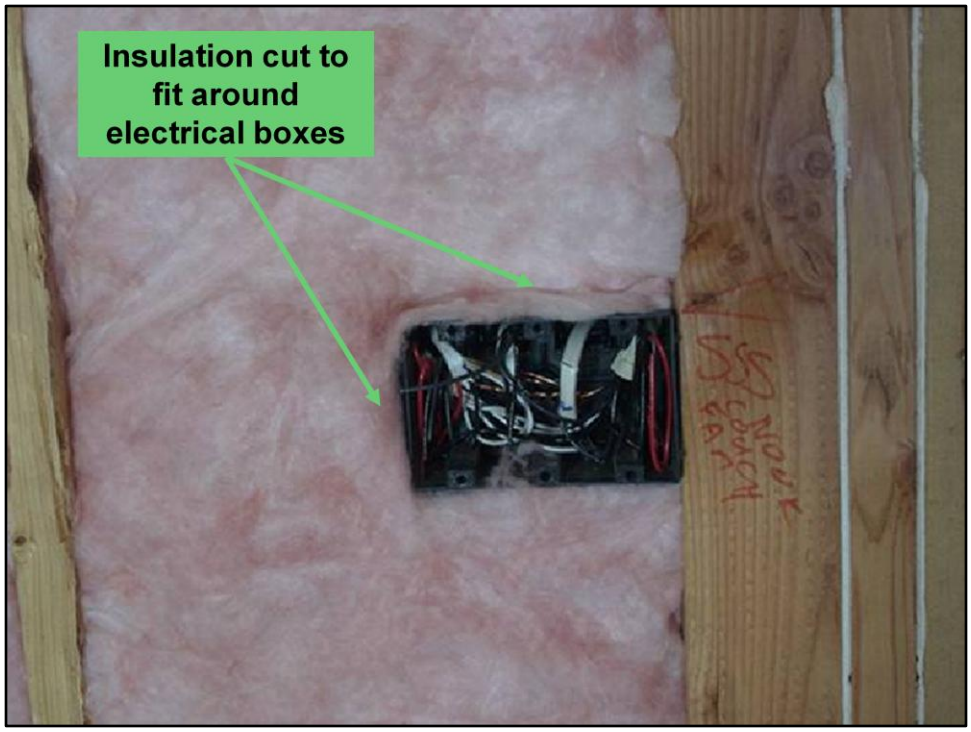


This is an animated slide. Please be sure to note the order of the animation.

Narrative: The batt on the left was incorrectly run behind the wire instead of being split around the wire. Animate red text box and arrows. As a result the batt is compressed and will not be touching the drywall.

The batt on the right is how a batt should be installed around wiring. Animate green text box and arrows. They carefully split the batt from the bottom, and place one half at the back of the cavity – behind the wiring – and they can then lay the other half down and over the wire.

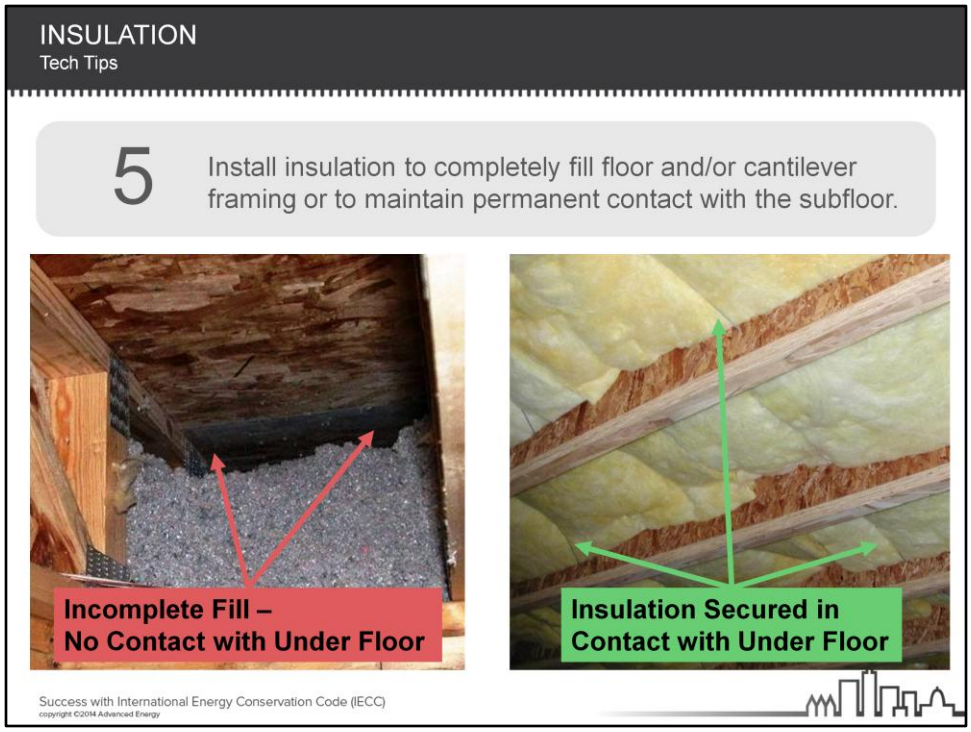
Point of Slide: Cut and split insulation around blocking, plumbing, HVAC and electrical components as required by IECC Tables 402.4.2 and 402.4.1.1.



This is an animated slide. Please be sure to note the order of the animation.

Narrative: Give the audience a few seconds to look at the slide. Animate green text box and arrows. Note how the insulation material is cut to fit snuggly and completely around the electrical box. All of the insulation in the wall and around the electrical box will be able to maintain contact with the drywall.

Point of Slide: Cut and split insulation around blocking, plumbing, HVAC and electrical components as required by IECC Tables 402.4.2 and 402.4.1.1.

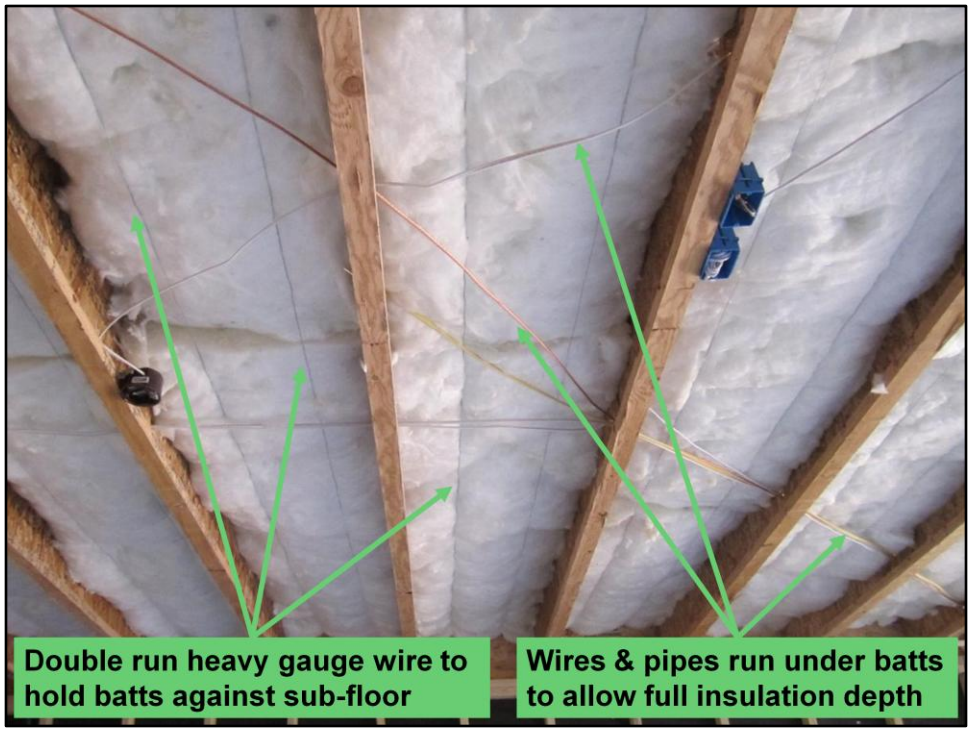


This is an animated slide. Please be sure to note the order of the animation.

Narrative: The floor on the left was poorly insulated. The builder spent the money to blow cellulose in the floor, however, the contractor did not use enough cellulose. Animate red text box and arrows. As a result the insulation is not in contact with the under floor of the room over the garage. Even good intentions can go awry.

The floor on the right has been properly insulated; animate green text box and arrows. Note how the insulation is complete and in permanent contact with the under floor.

Point of Slide: Install insulation to completely fill floor and/or cantilever framing or to maintain permanent contact with the subfloor as required by IECC Tables 402.4.2 and 402.4.1.1.



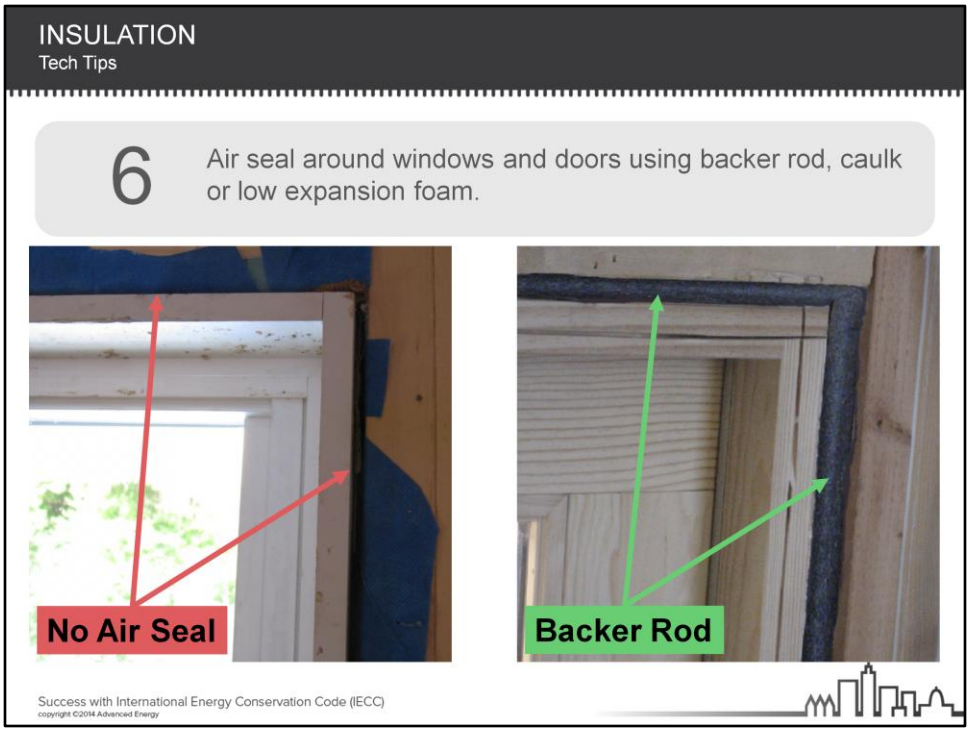
This is an animated slide. Please be sure to note the order of the animation.

Narrative: This is another good example of properly installed under floor insulation. In fact, this is a better example than the previous because the method of holding the insulation in place is a more effective long term strategy.

Animate the first green text box and arrows. As you can see they have used a heavy gauge wire, probably in the 12-18 gauge range, double run to support the batts up against the underside of the sub-floor. This is a much more effective, long term solution than metal rods (also called stays or tiger teeth) that will withstand people walking on the floor, or kids running and jumping in a bonus room!

Animate second green text box and arrows. They have also made sure to run the wiring and piping below the batts to allow full insulation depth without compression or gaps.

Point of Slide: Install insulation to completely fill floor and/or cantilever framing or to maintain permanent contact with the subfloor as required by IECC Tables 402.4.2 and 402.4.1.1.

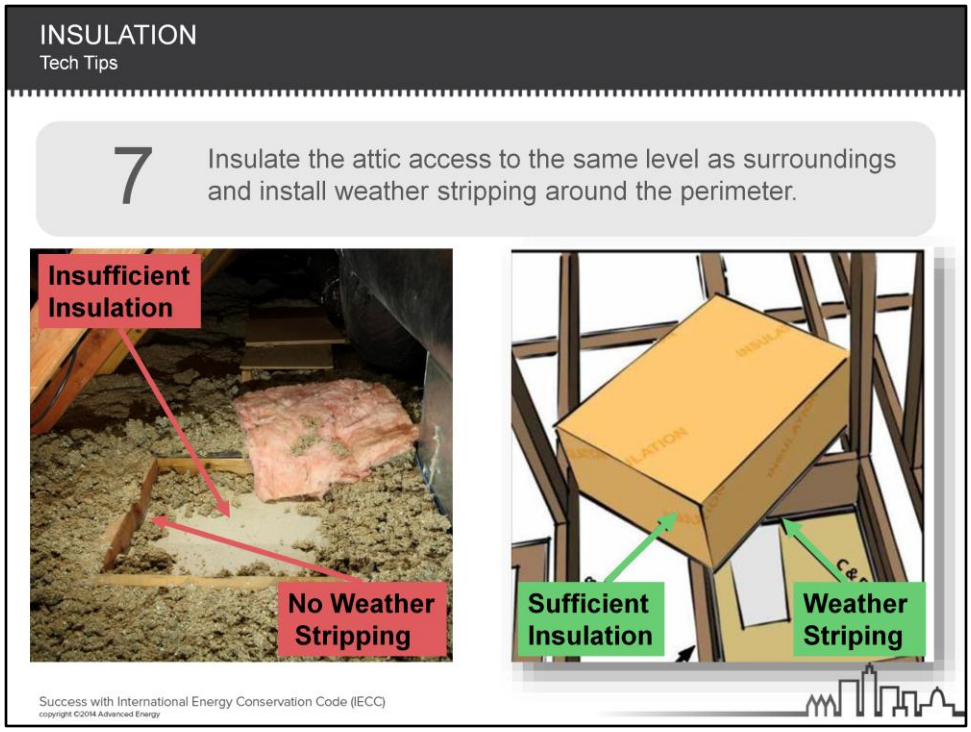


This is an animated slide. Please be sure to note the order of the animation.

Narrative: If this detail looks familiar, it is because we also called it out in the framing and air sealing module. On the right is an example of a window opening that has not been sealed (Click to animate the first text box and arrow). There are lots of materials that can be used for this, including caulk, low expanding foam or backer rod. But fiberglass insulation is not an appropriate air sealing material in this location.

Click to animate the next text box and arrow. Here backer rod, a coated foam material similar to a thin pool noodle, has been installed in the opening between the window frame and the rough opening. Backer rod does a good job of forming an air seal and has no risk of over expanding and interfering with the opening and closing of the window.

Point of Slide: As outlined in 2009 IECC Table 402.4.2 and 2012 IECC Table 402.4.1.1, air seal around windows and doors using backer rod, caulk or low expansion foam



This is an animated slide. Please be sure to note the order of the animation.

Narrative: The attic access on the left has had the insulation pushed aside (animate red text and arrows) and also lacks weather stripping. Not only is the amount of insulation insufficient, but the insulation was not mechanically fastened, making it easy for the homeowner or a trade entering the attic to push the insulation aside.

The drawing on the right, animate green text box and arrows, shows insulation that will meet the insulation installed in the attic, and also shows weather stripping attached to the attic opening. A great option for the hatch insulation is to use a few inches of rigid foam board and mechanically attach it to the access in combination with a plywood backing, or with liquid nails that is appropriate to use with foam.

Point of Slide: Insulate the attic access to the same level as surroundings and install weather stripping around the perimeter required by IECC Tables 402.4.2 and 402.4.1.1.

This is an animated slide. Please be sure to note the order of the animation.

Narrative: It is important to also frame an access dam or some other form of blocking to prevent insulation from falling through the access or being displaced when removing the access hatch, animate green text and arrows.

Dimensional lumber like the drawing is a great option because it is sturdy and will hold up if a contractor or homeowner rests a ladder on the opening or pulls on the framing when accessing the attic.

Point of Slide: For attics with loose fill insulation, install baffles around the attic access opening as required by IECC Tables 402.4.2 and 402.4.1.1.

This is an animated slide. Please be sure to note the order of the animation.

Narrative: Ask the class the question, "What is the best type of insulation?"

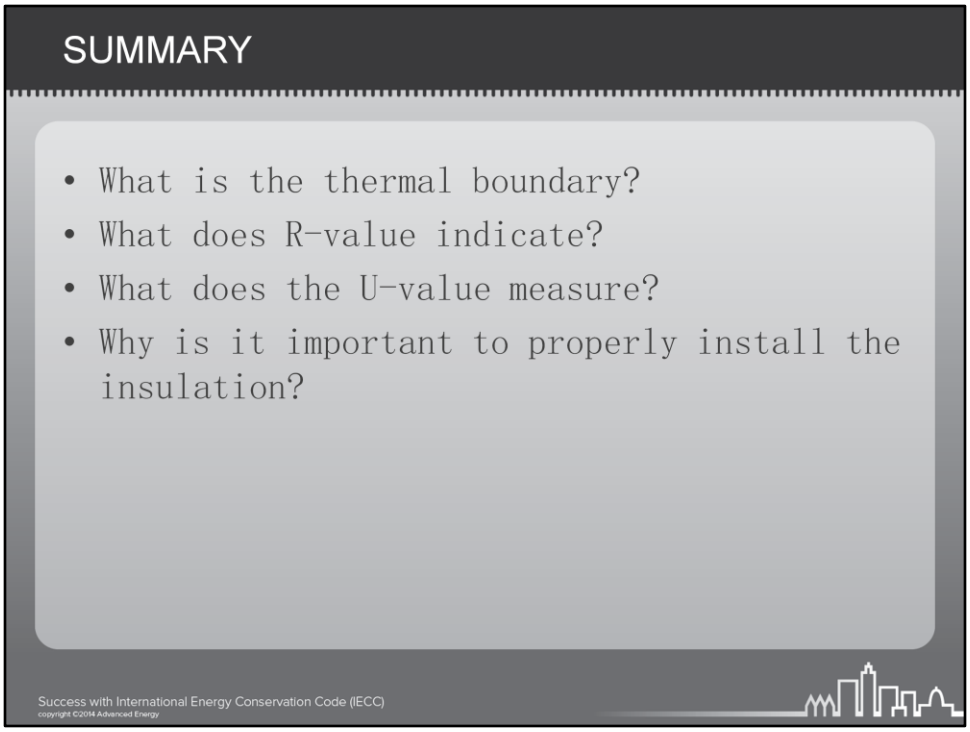
Give them a few seconds and someone should get the answer because we covered this earlier: "Any insulation that you can get installed correctly!"

Spray foam works great. It has high insulation value per inch and has air sealing properties, but it is much more expensive. And it is not a silver bullet, the installer has to know what they are doing.

Advance to next pic. Spray cellulose is another great option. It fills the voids and gaps and around obstructions like wires and piping great, and it tends to be liked better by raters and inspectors. But is not a perfect product. The mix needs to be right to prevent settling and crumbling, and the framing details needs to be done right.

Advance to next pic. As we have seen in this presentation, fiberglass can be installed correctly, it just takes some attention to detail by the installer, in combination with good backing, blocking and air sealing details.

Point of Slide: What is the best type of insulation: Any insulation that you can get installed correctly! That means meeting the framing, blocking, air sealing and installation details established by IECC Tables 402.4.2 and 402.4.1.1.



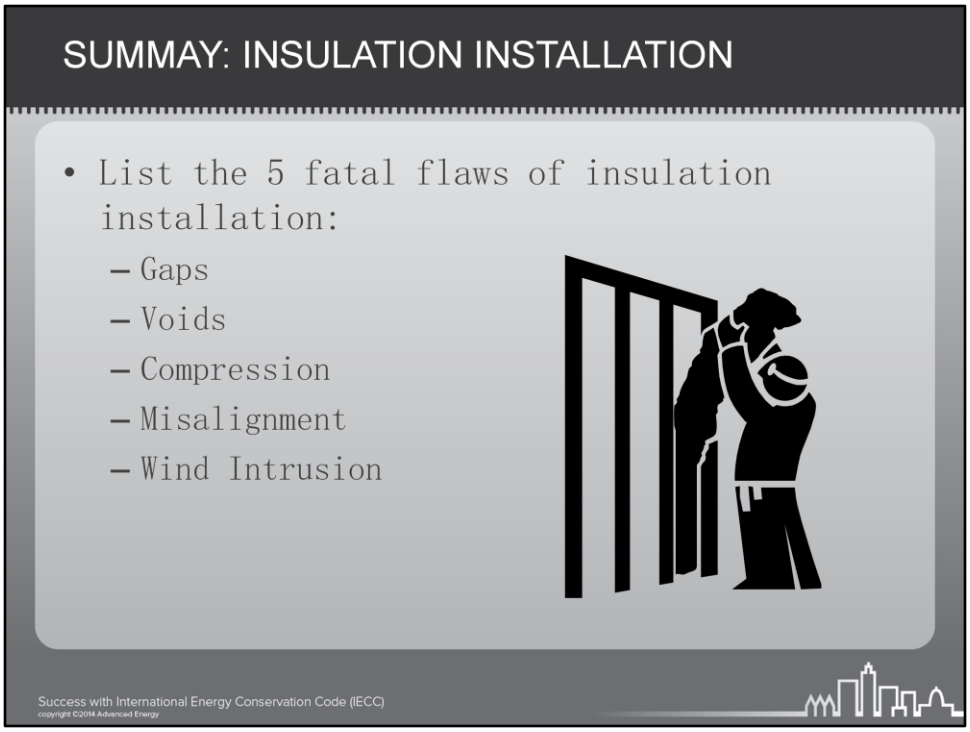
Narrative: Learning objectives are what we hope to have all (willing) participants achieve.

To demonstrate understanding, ask the class:

- What is the thermal boundary? GIVE THEM A MINUTE OR TWO TO ANSWER, THEN ASK: What are some examples of thermal boundary (i.e. insulation) material?
- What does R-value indicate? GIVE THEM A MINUTE OR TWO TO ANSWER, THEN ASK: What are the R-values per inch of some standard insulation materials? (ANSWERS: Standard Fiberglass Batt, R-3; High Density Batt, R-3.5 to R-4; Loose fill fiberglass, R-2.2 to R-3; Loose fill cellulose, R-3.2 to R-3.8; Loose fill rock wool, R-3.3 to R-3.8; Polystyrene, R-4; Polyiso, R-7)
- What does the U-value measure?
- Why is it important to properly install the insulation?

Don't answer these for them. Encourage participation, repeat the answers volunteers provide and clarify any definitions as necessary

Point of Slide: Asking them to answer these questions gives them an opportunity to demonstrate understanding of the 2009 and 2012 IECC R-value, U-value and insulation installation requirements.



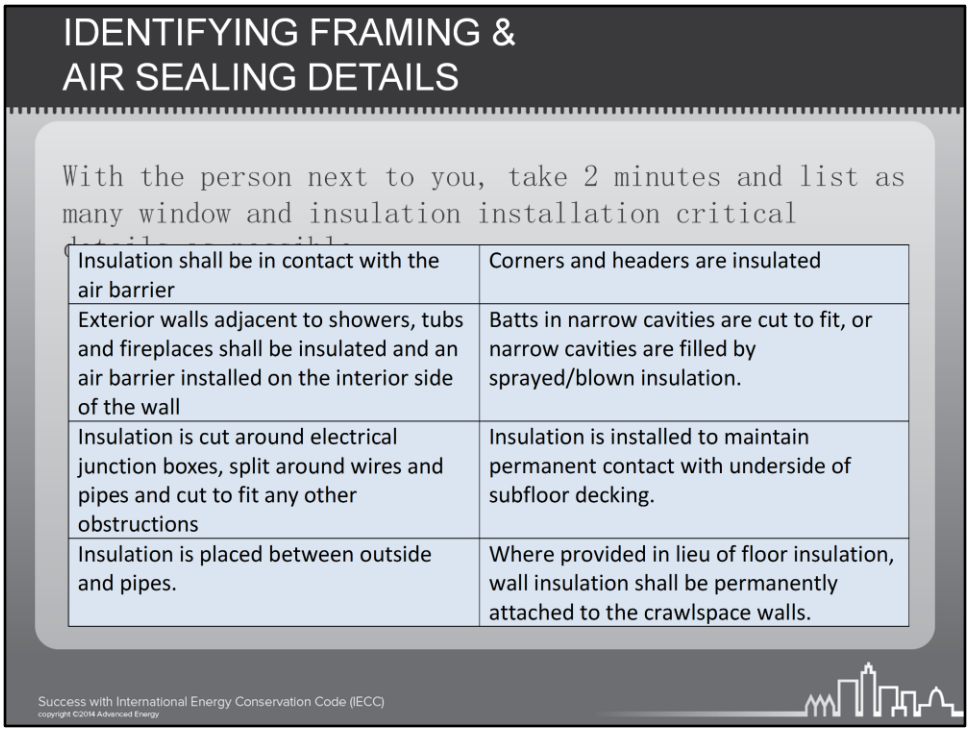
This is an animated slide. Please be sure to note the order of the animation.

Narrative: Ask the class, “What are the five fatal flaws of insulation installation?”

Give them time to answer. Don’t answer for them! If they get stuck, tell them to look in their books on the insulation tab!

After they have said all five, click through them on the slide.

Point of Slide: The five fatal flaws of insulation installation are gaps, voids, compression, misalignment and wind intrusion. These are R-value killers that prevent insulation from working to its full potential.



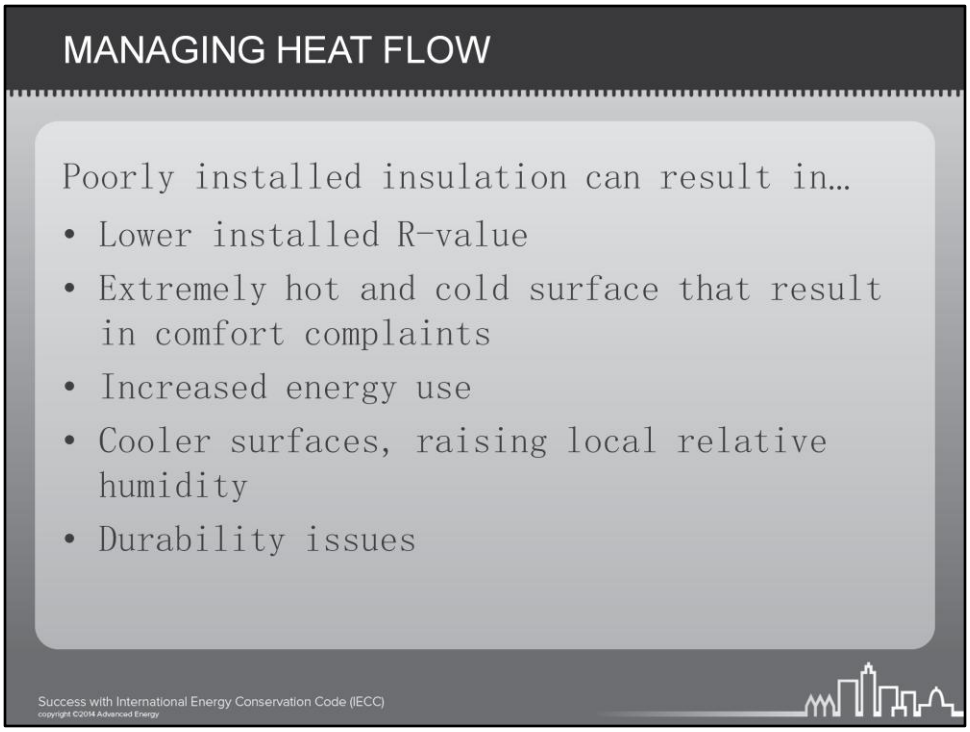
This is an animated slide. Please be sure to note the order of the animation.

Narrative: Ask the class to work with a partner and take 2 minutes to identify as many window and insulation installation critical details as possible.

- Encourage them to first come up with a list without using their guidebook
- After 45 seconds, let them know they are welcome to use their guidebook or reference their notes
- When the 2 minutes are up, ask for a group to volunteer a detail and write it down on a flip chart or white board, then encourage a second group to share a detail and write it down as well. Continue this process until you have at least one detail from most, if not all, of the groups

Click to animate the list of details and highlight any that weren't on your list. Let them know that all of them are important and required, although we generally focus our attention first at the top of the building, then the bottom and finally the walls.

Point of Slide: Asking them to list the details gives them an opportunity to demonstrate their knowledge of the requirements outlined in 2009 IECC Table 402.4.2 and 2012 IECC Table 402.4.1.1. This exercise also encourages them to utilize the guidebook one last time and establish the book as a useful resource for meeting the intent of the code moving forward.



Narrative: Throughout this session, we emphasized the benefits of system thinking as it relates to construction, and window and insulation details in particular. It is critical that building officials, builders, trades and designers understand the desired outcomes of the 2009 and 2012 International Energy Conservation Code, and why the insulation details and installation requirements are so important.

Poorly installed insulation can cause comfort issues, high energy use, moisture problems, durability concerns and health problems. We can never completely control heat flow, but through good insulation installation details we can better manage heat flow and limit problems.

Point of Slide: Poorly installed insulation has the potential to lead to a host of issues. When insulation is properly installed, the greater the benefits to occupants in terms of comfort, durability, air quality and energy use.

Narrative:

Ask the class, “Any final questions?”

If no one has any questions, go to your parking lot or list of participant learning objectives identified at the beginning of the session and make sure you addressed everyone's questions or concerns.

If you think a question hasn’t been answered or an issue hasn’t been resolved, don’t make up an answer! Instead, let them know you will follow up with the appropriate person and get back to them.

Point of Slide: Show you are responsive to attendees needs and want to maximize their value for the investment of their time.

Narrative: Thank everyone and share your contact info.

Point of slide: You are a resource for them moving forward and appreciate their participation!