

Map ID	Question	Answers	System Feedback
TV1	This wall was meant to be insulated as part of a recent work scope. Based on your evaluation of the area, would the installation pass final inspection?	1) Yes	Correct! The insulation is even and consistent within the wall cavities, and even with the blower door running, there is no sign of air leakage.
		2) No	Incorrect. There is no evidence to indicate the insulation installation was less than sufficient to meet work quality guidelines of filling the cavities. Try again.
		3) I can't tell	Incorrect. Use the IR scanner and blower door to evaluate the area and try again.
			Hint: If the walls appear a consistent temperature in the IR images (warm in this case), and there is little to no change when the blower door is running, the insulation is well installed.
TV3	Is there an air sealing opportunity around this window?	1) Yes	Incorrect. Try again.
		2) No	Correct. Even with the blower door running, there is no sign of air leakage here.
		3) I can't tell	Incorrect. Try again. Compare the IR image with and without the blower door running.
TV5	The homeowners usually put seating along this wall for sports viewing parties. On a cold night, would it be cozier to sit next to this window or the other window on this wall?	1) This window.	Incorrect. Compare the two windows with and without the blower door running. This one is leaky and would be draftier on a cold night.
		2) The other window.	Correct! The other window is better sealed and wouldn't be as drafty as this one.
		3) No difference.	Incorrect. Try running the blower door and looking at each window to see the difference.
TV6	This wall was recently retrofitted with dense packed insulation. Should it pass a final inspection?	1) Yes	Hmmm, you have pretty low standards. That's incorrect. Try again.
		2) No	Correct. There appears to be a large section where the insulation was only installed about 1/3 of the way up the wall. Further investigation is required, but if the wall was left empty, the insulators should come back and fill it.
		3) I can't tell	Sure you can. If insulation is missing, it will show up as a cold (dark purple) area in the wall, and the job should not pass.

Map ID	Question	Answers	System Feedback
TV7	This wall was meant to be dense-packed with cellulose insulation. Run the blower door to evaluate the insulation. Is it dense-packed?	1) Yes	Incorrect. Properly installed dense-packed cellulose insulation hinders airflow through the wall. The purple feathering indicates air movement through the wall, so the insulation wasn't installed properly.
		2) No	Correct. The purple feathering indicates air movement. You would not see this in a properly dense-packed wall.
		3) I can't tell	Compare the IR images with and without the blower door running. If there is any change indicating air movement, the insulation wasn't installed densely enough to stop air movement.
			Tip: Cellulose insulation should be installed at around 3.5 pounds per cubic foot. If correctly installed, it can significantly reduce air leakage as well as improving the home's insulation.
TV8	What is most likely causing the cooler splotches on the wall?	1) Cold air from outside	Incorrect. Air leaks tend to show up and distribute more evenly in the wall.
		2) Missing insulation	Good guess, but not the case here. When blown-in insulation settles it does sometimes look similar to this, but you don't usually see so much contrast in the image as shows up here, without a blower door running.
		3) Plumbing leak	Exactly! The inconsistent splotching has the same shape as water stains. Using the moisture sensor confirms that this fault in the insulation is due to water damage.
			Tip: Try using the moisture sensor.
LR3	This wall was meant to be dense-packed with insulation. Installers often miss the areas above windows. Does the wall above the window appear to be well insulated?	1) Yes	Correct! There appear to be no gaps or voids in the insulation above the window.
		2) No	Incorrect. If they had missed this area, the empty bays would show up as colder than the surrounding wall, even without the blower door running.
		3) Not sure	If the installers had missed this area, the bays would show up as colder than the surrounding area. Evaluate the area and try again.
LR4	Without looking at the floor plan map, try to determine if this wall is adjacent to outdoors/unheated space or to another heated room. What do you think is on the other side of this wall?	1) Heated space	Correct!
		2) Unheated space or the outdoors	Incorrect.
		3) I can't tell	Try running the blower door. Usually you can see some minimal change in the IR image if you are adjacent to outdoor space and there is a temperature difference between indoors and out.
			Tip: IR scans provide the most reliable images when there is a temperature difference of at least 18 degrees F between inside and outside.

Map ID	Question	Answers	System Feedback
LR5	What is the name of the phenomenon illustrated by the purple lines in the IR image?	1) Thermal bridging	Correct! The wood framing has a lower resistance to heat transfer, or R-value, than the surrounding walls, causing greater heat transfer along those framing members, which show up as cold lines on the IR image.
		2) Convective loops	Incorrect. Convective loops or any convective heat loss would likely show up as a change in the IR image when you run the blower door. Try again.
		3) Radiant barriers	Nope. Try again.
K1	Evaluating the IR images of this area reveals a couple problems. One is air leakage around the window trim. What is another?	1) Water leaks around window trim	Nope. There may be water leaks, but none are evident in the IR images. Look again.
		2) Missing ceiling insulation	Incorrect. Missing insulation would show up as cold spots even without the blower door running. Try again.
		3) Air leakage at the wall/roof juncture	Correct! Check the area from the outside. Roofs like this, also common over porches, are often problem sites.
			Tip: Run the blower door and see if the image changes. What does that tell you?
DR1	A new outlet was recently installed in this wall. Based on the IR image, which of these most likely happened?	1) Wiring was added and insulation batts were cut to fit around the wiring, leaving no gaps or voids in the insulation of this wall.	Incorrect. There is evidence of a cold area, which would not be the case if insulation was fitted snugly in the wall cavities.
		2) Insulation was cut away to make way for the wires, and no new insulation was installed below.	Correct! While it's impossible to say for sure how the wall ended up this way, this is the most likely scenario, based on the IR images, which show that each wall cavity under the window is likely missing insulation at the bottom.
		3) Insulation was pinched by the wiring.	Incorrect. Usually when that happens it shows up as a line where the wiring is pinching the insulation. Where the insulation puffs around the wiring above and below would be the same color as the rest of the wall.

Map ID	Question	Answers	System Feedback
DR2	What is most likely causing the purple splotches on the window trim?	1) Wind	Not quite. If this was the case, the blower door would make a difference in the IR image. Did you compare images with and without the blower door running?
		2) Water	Correct! The splotchiness and high contrast are typical of moisture on IR images. Windows and other penetrations of the building envelope can allow moisture intrusion if not properly flashed and detailed. Further investigation is required.
		3) Sun	Incorrect. Sun shining on the outside of a house can and does effect IR images, but this image doesn't look like it's caused by sun. Compare the temperature of the purple splotches to surrounding materials using the temperature scale at the side of the image.
			Tip: Try using the moisture sensor.
DR3	Is the wall a better or a worse insulator than the window above?	1) Better	Correct! You can tell by the temperature readings of the wall and window that the wall stays warmer during cold weather.
		2) Worse	Incorrect. Check the temperature readings on the IR images for the window and the wall and try again.
		3) I cant' tell	Incorrect. Check the temperature readings on the IR images for the window and the wall and try again. You have enough information to make an informed decision.
DR4	Is the glass a better insulator than the wood window frame?	1) Yes	Incorrect. The cooler temperature reading of the glass indicates lower resistance to heat movement.
		2) No	Correct! The wooden frame offers greater resistance than the glass.
		3) Not sure	Compare the temperature of the glass to the temperature of the wood frame using the temperature/color scale on the right side of the IR image. In this scenario, the colder area is the worse insulator. Is the glass a better or worse insulator than the wood?
DR5	Would it be comfortable to walk barefoot on this floor in the winter?	1) Yes	Incorrect. You must like having cold toes! This floor would be very cold to walk on.
		2) No	Correct! Time to break out the bunny slippers and fuzzy socks.
		3) I can't tell	Use your diagnostic tools to see if you can figure it out.
			Tip: Running the blower door shows you how the walls and floors respond to windy weather. Can you see any clues through the IR camera when you have the blower door running? What would this area be like on a cold, windy winter night?

Map ID	Question	Answers	System Feedback
DR6	This wall was recently retrofitted with dense packed insulation. Should it pass a final inspection?	1) Yes	Correct! Even with the blower door running, there is no evidence of missing insulation, which would show up as cold (dark purple) spots in the infrared image.
		2) No	Hmmm, what reason would you give for not passing it? That answer is incorrect. Try again.
		3) I can't tell	Sure you can. If insulation is missing, it will show up as a cold (dark purple) area in the wall, and the job should not pass. Look again.
			Tip: Even though this wall abuts the garage, as long as it's an unheated garage, IR scans can still tell you a lot about what is happening inside the wall.
DR7	This wall was meant to be dense-packed with cellulose insulation. Run the blower door to evaluate the insulation. Is it dense-packed?	1) Yes	Correct! Properly installed dense-packed cellulose insulation hinders airflow through the wall, so you see no change in the IR image, even with the blower door running.
		2) No	Incorrect.
		3) I can't tell	Compare the IR images with and without the blower door running. If there is any change indicating air movement, the insulation wasn't installed densely enough to stop air movement.
			Tip: Properly installed dense-pack insulation can reduce air leakage by over 50%.
2H1	Run the blower door to evaluate this attic hatch. Is there an air sealing opportunity?	1) Yes	Nice work! The dark purple feathering around the edges shows cold air being pulled from the attic when the blower door is running.
		2) No	Incorrect. If you run the blower door, leaks are revealed.
		3) I can't tell	Compare the IR photos with and without the blower door running. Is there any change? If so, there is an air sealing opportunity.
			Tip: Attic hatches should be insulated to the same R-value as the rest of the attic and sealed around the edges to prevent air leakage.

Map ID	Question	Answers	System Feedback
2H2	This ceiling used to look thermally ideal. An electrician was recently working in the attic around this light fixture. Based on the IR image, which of these most likely happened? The electrician:	1) Spilled a beverage.	Nope. A beverage spill <u>would</u> likely show up on an IR image, but the contrast would likely be greater, and the shape not quite so uniform.
		2) Did not replace the insulation around the wiring.	Correct! The purple haze indicates where the insulation isn't in contact with the air barrier of the ceiling anymore. That area of the ceiling is colder than the rest, where insulation was left in place.
		3) Put everything back as it was, this is as good as it gets.	Not quite. Note the purple haze coming from one side of the light fixture. That part of the ceiling is colder than the rest for some reason. Try again.
			Tip: Light fixtures like this, commonly called "can lights," come in IC- and non-IC-rated versions. IC-rated means it can safely come into contact with insulation. There are ways of properly air sealing and insulating both types, but if installing new, especially where they penetrate into unconditioned space like here, the IC-rated varieties are recommended.
BR1.1	Based on the IR image, which of these is most likely true?	1) Wall top isn't properly insulated.	Correct! Known as the top plate, if the top framing members of the wall aren't covered with insulation, it allows thermal bridging, as seen in this IR image.
		2) Wall cavity is not properly insulated.	Incorrect. Based on the image, the wall cavity looks well-insulated.
		3) Water is leaking from the roof.	Incorrect. There is no water leakage evident in the image.
			Tip: Insulation is often, improperly, held back from the edges of the attic so it does not cover the top plates of the wall framing. This reduces the effectiveness of the insulation.
BR1.2	Use the blower door to evaluate this corner. What does the IR image show?	1) The ceiling corner needs additional air sealing or insulation in the attic.	Nope! The IR image shows a well sealed and insulated ceiling corner.
		2) The window trim is not well air-sealed.	Nope! The IR image shows there is no air leakage around the window trim, even with the blower door running.
		3) The framing and trim show no evidence of air leakage or poor insulation.	That's correct! The IR image shows well sealed window trim and a well sealed and insulated ceiling corner.

Map ID	Question	Answers	System Feedback
BR1.3	What is likely causing this watercolor effect at the wall/ceiling juncture?	1) Air leakage	Correct! If this house has vented soffits, those cold areas could be evidence of "wind washing," when cold air blows through fiberglass or other susceptible insulation.
		2) Thermal bridging	Incorrect. Try again.
		3) Plumbing leak	Incorrect. Review the floor plan, there are no plumbing pipes in the area so a plumbing leak is highly unlikely.
			Tip: Paying attention to where you are in the home helps put your observations into context and results in better overall evaluations.
BR1.4	The home owner mentioned this room gets very cold on cold, windy nights. Based on your evaluation of the area, which of these is the most effective measure the homeowner could install to keep the room warmer?	1) Insulate the walls around this window.	Incorrect. The walls appear to be well-insulated, so this measure would not be the most effective option.
		2) Caulk the window trim.	Correct! With the blower door running, you can see there is a lot of air leakage around this window.
		3) Install a tinted window film.	Incorrect. A tinted window film may help reduce sun-related overheating of the room, but would not address the issue in question.
			Hint: Compare the area with and without the blower door running. A blower door depressurizing the home to -50 Pascals is equivalent to a 20 mph wind blowing on all sides of the home. It mimics how the home behaves in windy conditions.
BR2.1	Based on the IR image, is the ceiling insulated over this light fixture?	1) Yes	Incorrect. Note the temperature scale in the IR image. The temperature of the fixture is much lower than the surrounding ceiling.
		2) No	Correct! The IR image shows the fixture is much colder than the surrounding ceiling, indicating no insulation.
		3) I can't tell	Look again. Using the color/temperature scale in the IR image, compare the temperature of the fixture to the surrounding ceiling.
			Tip: The light fixture, commonly known as a "can light," penetrates the thermal boundary of a house. These fixtures are often sites of significant air leakage in homes.

Map ID	Question	Answers	System Feedback
BR2.2	Note the yellow stripes on the ceiling indicating the framing members. Based on the temperatures of the materials, are the ceiling framing members increasing or decreasing the overall R-value of the attic?	1) Increasing	Correct! In this scenario, it is warmer inside than outside. The framing members are warmer than the surrounding ceiling, indicating that they are resisting heat transfer (have a higher R-value) than the surrounding ceiling. Wood has an R-value of about R-1 per inch. This attic must not be very well insulated!
		2) Decreasing	Incorrect. Remember, this house is warmer inside than it is outside, so cooler areas are showing greater heat loss to the outdoors or the attic. Try again.
		3) Not sure	In this scenario, where it's colder outside than inside, cooler areas indicate lower resistance to heat transfer. Warmer areas indicate better R-value, and so would add to the overall R-value. Look at the temperatures and try again.
BR3.1	What is the temperature difference between the very coldest and the very warmest item shown in this image? (Round to the nearest whole number.)	1) 10 degrees F	Incorrect.
		2) 20 degrees F	Correct!
		3) 30 degrees F	Incorrect.
			Hint: Look at the temperature/color scale on the right side of the image.
BR3.2	This wall is insulated with batts. Homeowners said they've heard scrabbling noises in the area, and the wall seems cold. Based on your evaluation of the area, what is most likely the cause?	1) Rodents have been taking the insulation away to create pathways or a nest somewhere else.	Correct! Given that the lower insulation is missing, it's most likely that pests are to blame. Further investigation is required.
		2) Poor insulation installation	Not likely. Poor batt insulation installation usually shows up more as bunched up or compressed insulation areas, blotchy cold spots on the wall. This is something else.
		3) Water leakage through the window trim when it rains.	Not likely. If water was leaking through the window trim, it would usually show up cold closer to the leaky trim, or show a settling pattern as it seeped down the wall. Try again.
BR3.3	Use the blower door to evaluate this wall. What is the most likely cause of the cold areas shown in the IR image?	1) Voids in the insulation	Correct! There is no change when the blower door is running, indicating missing insulation instead of air leakage.
		2) Hole in exterior sheathing	Not quite. Air leakage through a hole was the culprit, you would see a change in the IR image when the blower door was running, as air was pulled through the hole and into the wall.
		3) Moisture in the walls	Nope. It's a reasonable guess, but moisture often shows up a little splotchier with higher contrast. Try again.

Map ID	Question	Answers	System Feedback
MB1	Use the blower door to evaluate this corner. What does the IR image show?	1) The ceiling corner needs additional air sealing or insulation in the attic.	Yep! Critical junctures like this wall/ceiling corner are often weak points in a building's thermal performance.
		2) The window trim is not well air-sealed.	Nope! The window trim is well sealed.
		3) The framing and trim show no evidence of air leakage or poor insulation.	Nope! There is a weak point somewhere. Try again.
			Tip: If the wall top was air sealed in the attic, and insulation extended over the framing, there would be little to no change in the IR image with the blower door running.
MB2	This window was recently replaced. Did the installers do a good job?	1) Yes	Correct! The window appears to be well sealed, and there are no gaps in the insulation. It looks like the installers did a good job.
		2) No	Incorrect. Evaluate the air tightness and the insulation levels. If everything looks good, the installers did a good job.
		3) I can't tell	Incorrect. Use your available tools and what you know about air sealing and insulation to make a judgment call.
			Hint: Sometimes installers don't insulate between the framing when replacing windows. This shows up in IR scans if there is adequate temperature difference between inside and outside. Sometimes they don't caulk the trim, which allows air leakage around the window. Can you see evidence of either of these common installation shortfalls?
MB3	Run the blower door to evaluate this window. Is there an air sealing opportunity?	1) Yes	Correct! This window trim is poorly sealed, allowing air to come through.
		2) No	Incorrect. If you run a blower door test the leaks are revealed.
		3) No idea	Compare the IR pictures with and without the blower door running. If there is a change, there is likely an air sealing opportunity.
			Tip: When used in conjunction with a blower door, visual tools like IR cameras or smoke pencils reveal specific air leakage sites.

Map ID	Question	Answers	System Feedback
MB4	Run the blower door to evaluate this window. Is there an air sealing opportunity?	1) Yes	Incorrect. Leaks would be revealed by purple feathering around the leakage sites when the blower door is running.
		2) No	Correct! The window is sealed well.
		3) I can't tell	Compare the IR pictures with and without the blower door running. If there is a change, there is likely air sealing opportunity.
			Tip: Running the blower door at a low pressure difference, around 10 PA, gives the evaluator more time to scan the building with an IR camera and detect leakage before the interior and exterior temperatures equalize. Once that happens, IR images are less revealing.
MB6	Run the blower door to evaluate this wall/ceiling juncture. Is there an air sealing opportunity?	1) Yes	Correct. The increased flow of cold air at the juncture indicates an air sealing opportunity, perhaps in the attached garage or in the attic.
		2) No	Incorrect. If you run the blower door, leaks are revealed.
		3) I can't tell	Compare the IR photos with and without the blower door running. Is there any change? If so, there is an air sealing opportunity.
			Tip: These areas are sometimes called "critical junctures" because it is so critical to home performance to get installation correct here.
MB7	Use the blower door to evaluate this wall. What is the most likely cause of the change you see when the blower door is running versus when it isn't running?	1) Rodent infestation	Nope. Rodents do sometimes disturb insulation, but there are other clues on this wall that lead you to the correct answer.
		2) Extra framing studs	Nope. Framing studs show up without the blower door running. That's not what causes the change.
		3) Insulation poorly installed around electrical wiring.	Correct! Note the outlet, indicating wiring runs through this wall. Insulation is often bunched around wiring, leaving voids, and wiring penetrations left unsealed in the attic provide a pathway for air leakage.
			Tip: Heat loss through conduction, like thermal bridging at wooden studs shown in both IR images, doesn't change when the blower door is running. Convective heat loss, from air movement, generally shows up as a change when you compare IR images with the blower door running versus without.

Map ID	Question	Answers	System Feedback
MB8	Run the blower door to evaluate this attic hatch. Is there an air sealing opportunity?	1) Yes	Incorrect. The even temperature on and around the door even when the blower door is running show that it is well sealed.
		2) No	Correct! The even temperature on and around the door show that it is well sealed.
		3) I can't tell	Compare the IR photos with and without the blower door running. Is there any change? If so, there is an air sealing opportunity.
			Tip: The blower door is depressurizing the home, so may pull the attic hatch into a more airtight position than it normally rests in. In a real home, check how the attic hatch sits in its frame without the blower door running. If it seems loose or wobbly, it may be a source of air leakage.