

10

Hidden Air Leaks in New Home Construction

AND HOW TO FIX THEM



10

Hidden Air Leaks in New Home Construction

Sealing common air leakage paths is the key to achieving a tight thermal envelope.

The Insulation Institute is committed to helping builders do this by making it easier to construct energy-efficient homes with fiberglass and mineral wool insulation. This guide outlines several hidden locations that are commonly overlooked when builders are developing an air sealing strategy. Builders can increase the chance of constructing an airtight home by training their subcontractors to take responsibility to repair all holes and leakage paths they create.

Our previous guide, [5 Priority Air Sealing Locations](#), detailed the areas with the largest total ACH50 reduction potential. However, that guide assumes that large holes or breaches in the thermal boundary of the home have already been addressed. In this guide, we take a step back to examine the big holes or hidden air leak paths that often go unnoticed during construction and that can be difficult to fix later. The key to closing these leakage paths is being aware that they exist, and addressing them when each area is constructed.



Some holes are obvious.



While others are not.

WHY HIDDEN AIR LEAKS MATTER

- **With the advent of the 2012** edition of the International Energy Conservation Code (IECC), sealing these locations is essential to creating the tight thermal envelope needed to meet more stringent blower door testing requirements.
- **Builders want to know** how to make their homes tighter, while protecting the bottom line. Simple air sealing techniques, tackled at the right time, along with attention to detail, can dramatically improve construction quality without significantly increasing costs.

HOW THESE LOCATIONS WERE IDENTIFIED

Research on air sealing locations and quantifying reductions in infiltration rates, has found that several large leakage paths are overlooked by builders and raters. While the reduction in ACH50 is not quantified for each item in this guide, these holes are large enough that they will result in a notable increase in airflow if not addressed.



01. Cantilevered Floors

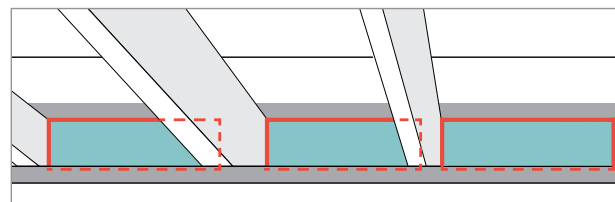
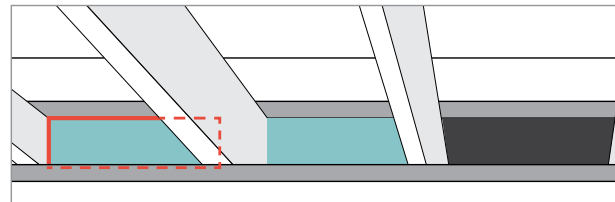
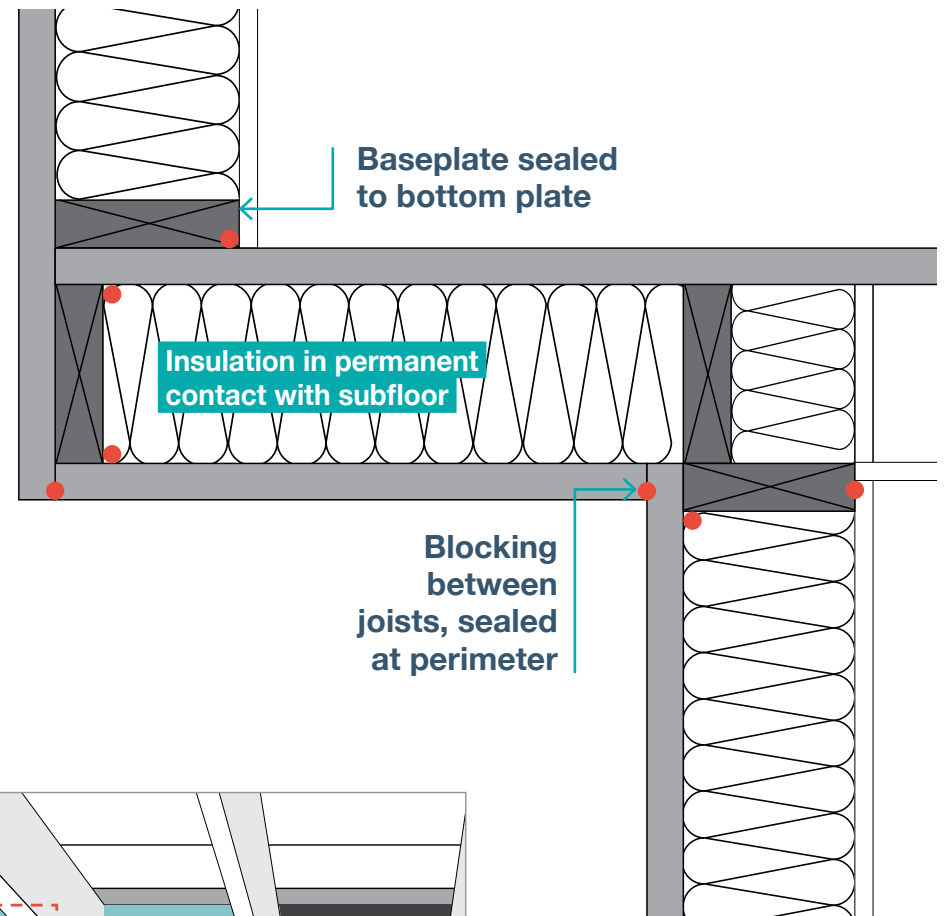
JOIST CAVITIES NOT AIR SEALED IN CANTILEVERED FLOORS

Problem

- Air leakage occurs where there are “bump outs” between two floors or beneath a bay window.
- If the joist cavities at these locations are left open, airflow can occur between the conditioned space and the outside of the building.

Solution

- Seal joist cavities with blocking where it meets the wall below and seal around the perimeter of each joist.
- Blocking when needed can consist of solid airtight material.
- Fill each joist cavity of the cantilevered floor with insulation in contact with the subfloor.
- Ensure the baseplate is sealed to the subfloor.
- Air seal each joist cavity by installing an air barrier against the face of the insulation.





02. Attic Penetrations

ATTIC PENETRATIONS NOT FULLY SEALED

Problem

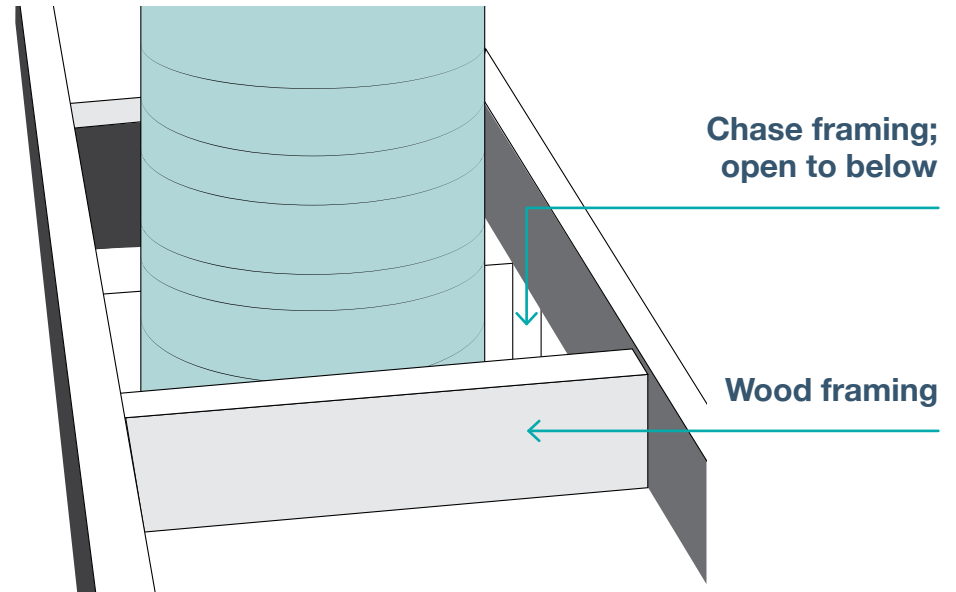
- Air leakage can occur where ductwork, piping, or an open chase passes through the ceiling/air barrier into the attic.

Solution

- Ensure each hole or chase created is blocked/air sealed, adding wood framing for support if necessary.

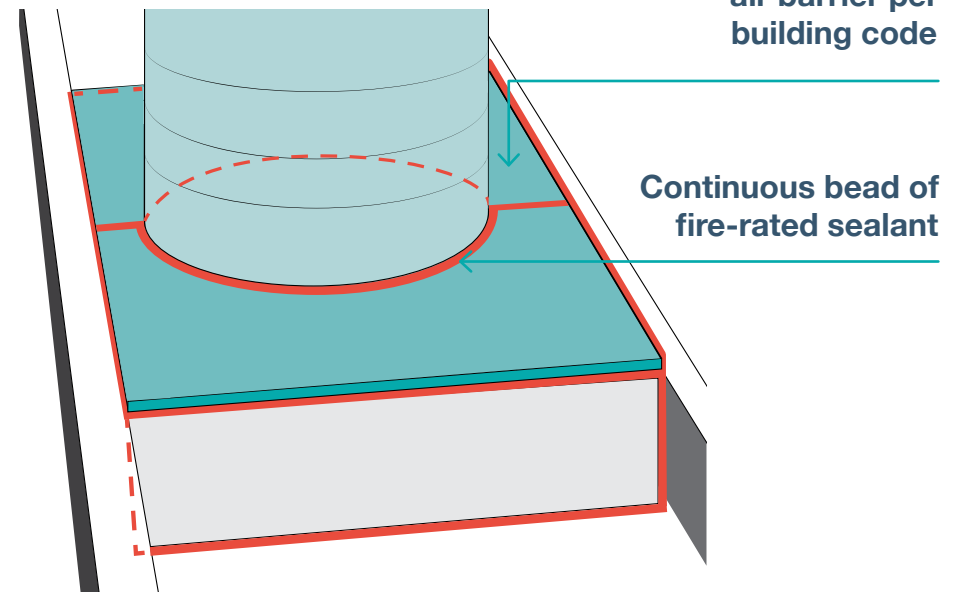
Caution: Do not put combustible materials in contact with hot ductwork, pipes, chimneys, flues, vents, and/or any other hot surfaces.

- Ensure the blocking and air barrier is continuously air sealed at all edges, then cover with insulation to the level found in the rest of the attic.



Caution: Do not put combustible materials near heated ductwork or piping.

Install appropriate air barrier per building code





03.

Soffits & Dropped Ceilings

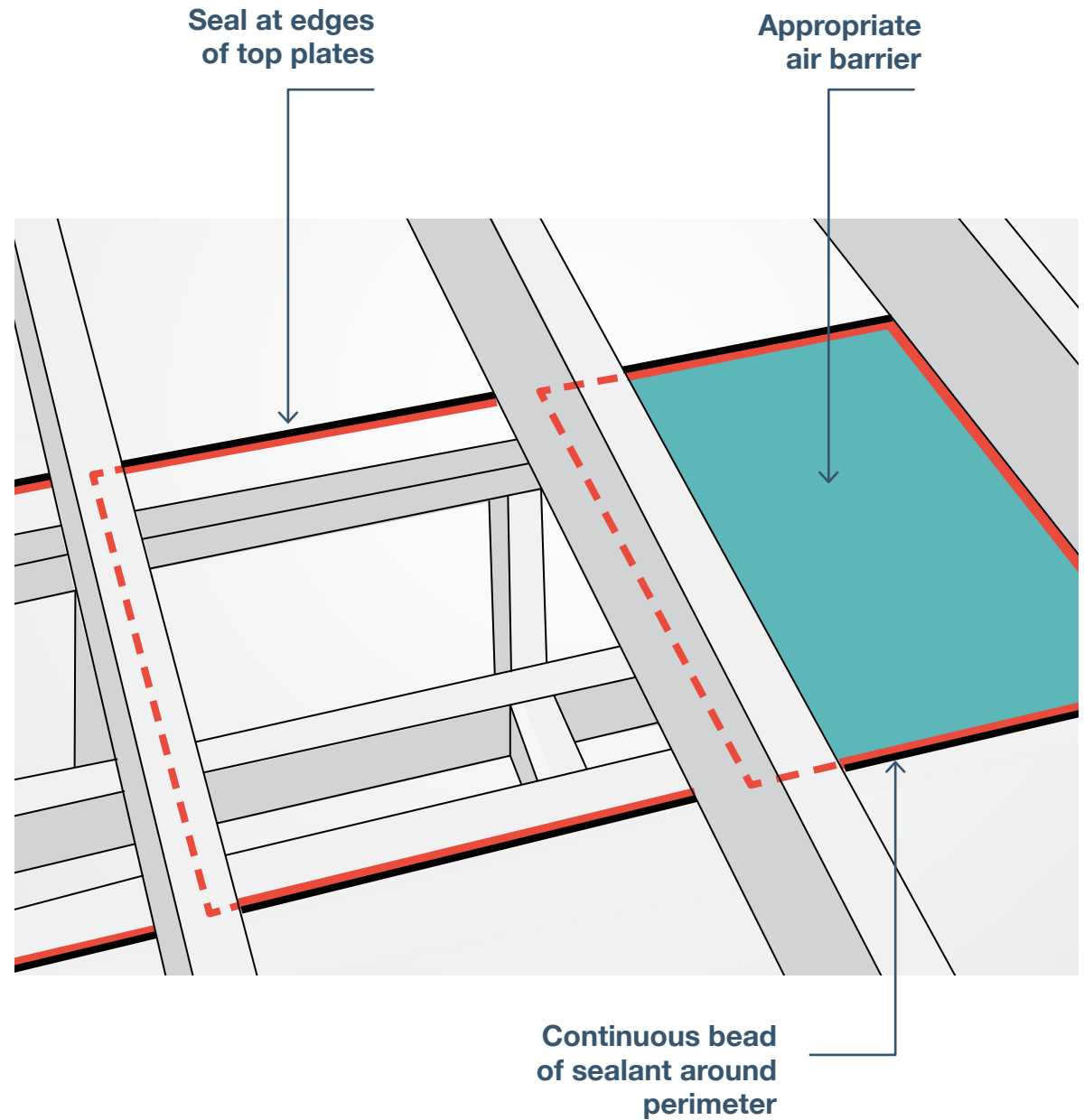
SOFFITS AND DROPPED CEILINGS LEFT OPEN

Problem

- Air leakage can occur where there are changes in ceiling height, either above kitchen cabinets, above bathrooms or in dropped ceilings that allow for ducts or piping chases.

Solution

- If soffit or dropped ceiling is on an exterior wall, be sure to install interior sheathing at the exterior wall prior to the soffit or dropped ceiling assembly.
- Secure the airtight material and the top plate with adhesive and/or fasteners. Apply a continuous bead of sealant around the perimeter.





04. Attic Knee Walls

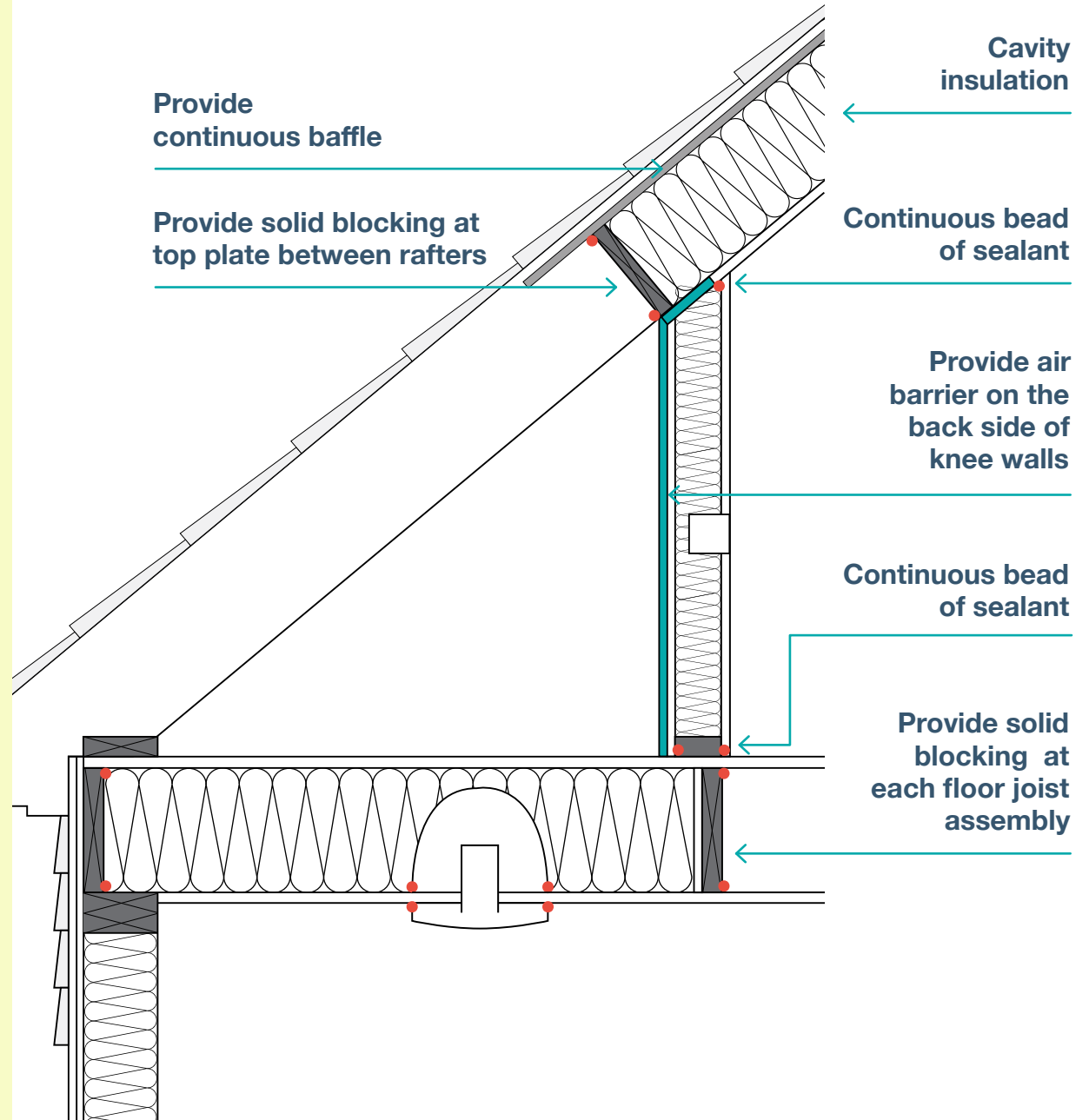
ATTIC KNEE WALLS LEFT UNSEALED

Problem

- Air barriers are often incomplete or non-existent on the exterior side of knee walls.
- Blocking is often missing in the cavity between the floor joists below the knee wall.

Solution

- Install exterior air barrier (such as OSB sheathing, rigid insulation, or gypsum board) and air seal around the perimeter.
- Seal all gaps in the air barrier by making sure the barrier reaches all the way to the top plate.
- If not already present, install and seal solid blocking in the floor cavity below the knee wall.





05.

Bathtubs and Shower Inserts on Exterior Walls

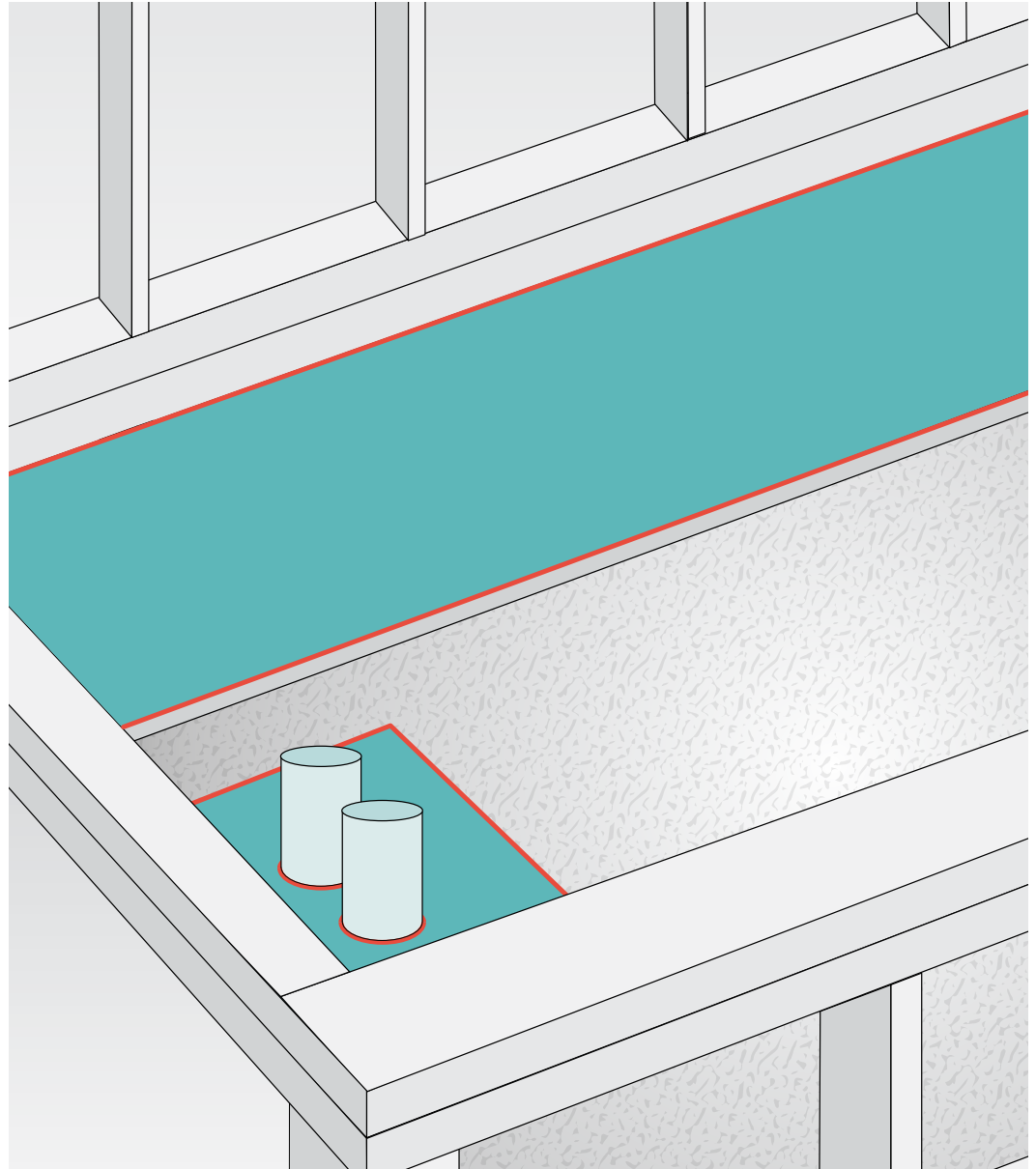
BATHTUBS ON EXTERIOR WALLS NOT PROPERLY INSULATED OR AIR SEALED

Problem

- When tubs and showers are installed on exterior walls, they must be insulated and air sealed at the exterior wall.
- Plumbing penetrations often extend between floors and/or conditioned space and the exterior, allowing air to pass freely.
- Tubs and shower inserts are often installed prior to typical air sealing, creating a difficult area to seal afterwards.

Solution

- Insulate the cavity and install an interior air barrier for the tub and shower enclosures on exterior walls before the bathtub and shower installation. Air seal the perimeter.
- Air seal all pipe and plumbing penetrations. Building codes require sealing for fire safety.





06. Fireplaces

FIREPLACES NOT PROPERLY SEALED

Problem

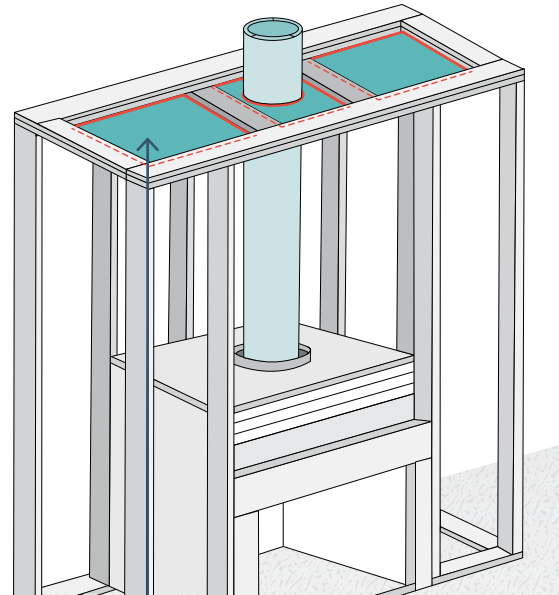
- Fireplaces that are placed on exterior walls often do not have insulation or an air barrier installed behind them.
- Fireplaces installed on the interior of the building require air sealing at the top where the chimney or vent penetrates the ceiling air barrier, typically the gypsum board.

Solution

- Install an interior air barrier and seal edges/seams prior to the installation of the fireplace.
- The air barrier must comply with manufacturers specifications and applicable codes.

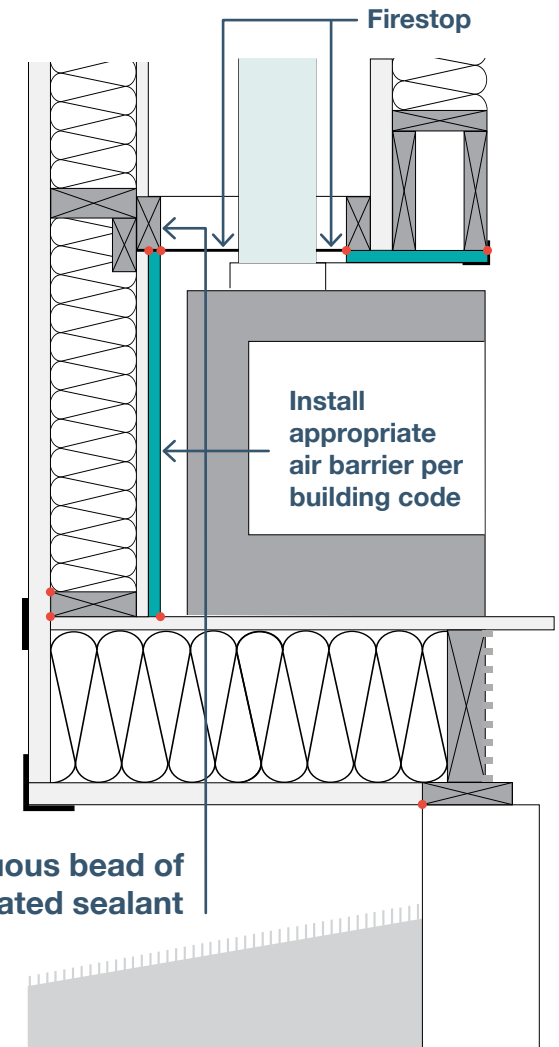
Caution: Do not put combustible materials in contact with hot ductwork, pipes, chimneys, flues, vents, and/or any other hot surfaces.

Inbound Fireplace



Install appropriate
air barrier per
building code

Outbound Fireplace





07.

Drop Over Top Floor to Attic at Stairs

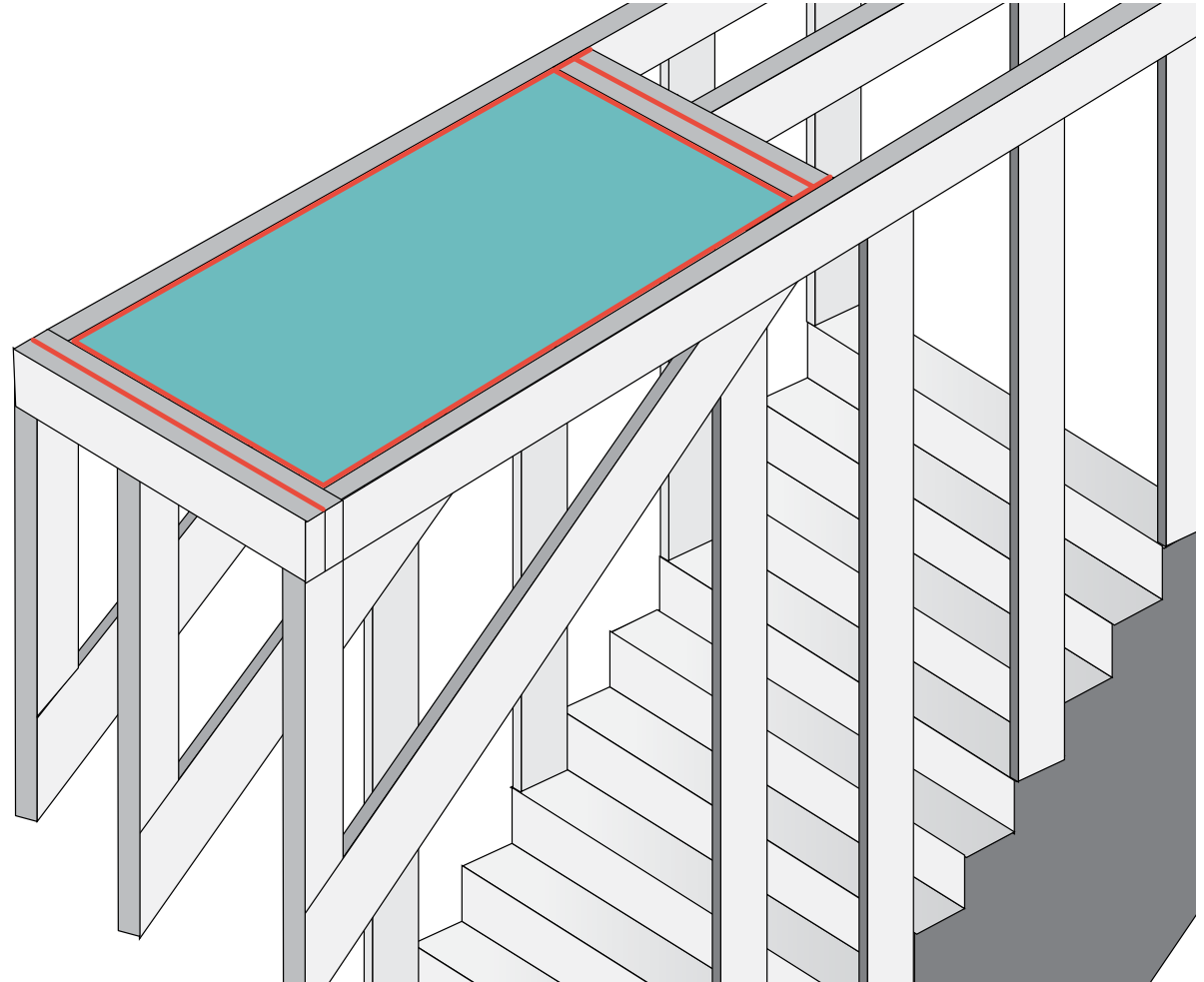
DROPS FROM ATTIC TO FLOOR BELOW AT STAIRWELL

Problem

- Often the attic drops down through the second floor to accomodate slopes above stairs.

Solution

- Sheath and seal drop at the same level as the attic floor.





08.

Porch Roof-Wall Connection

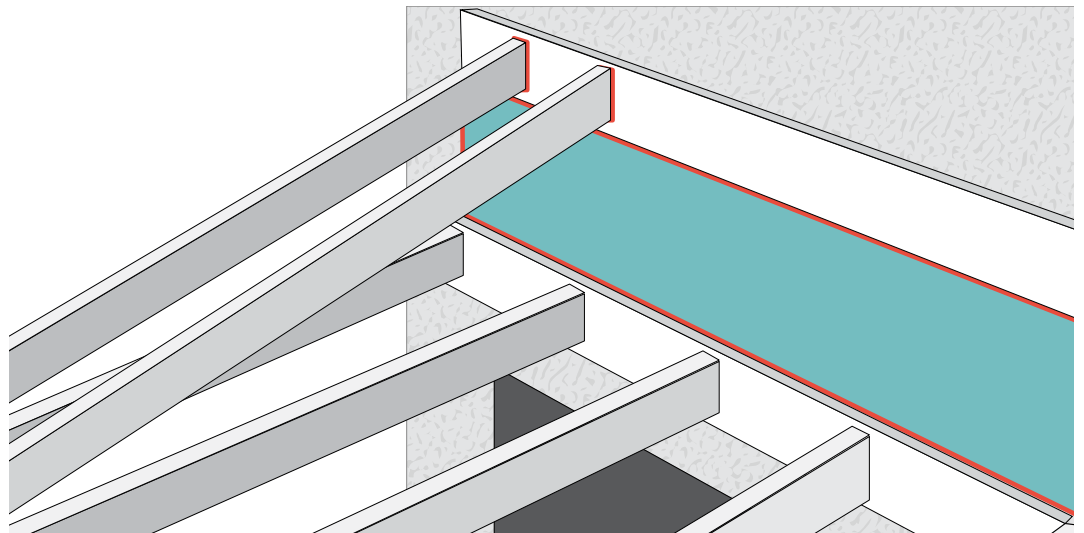
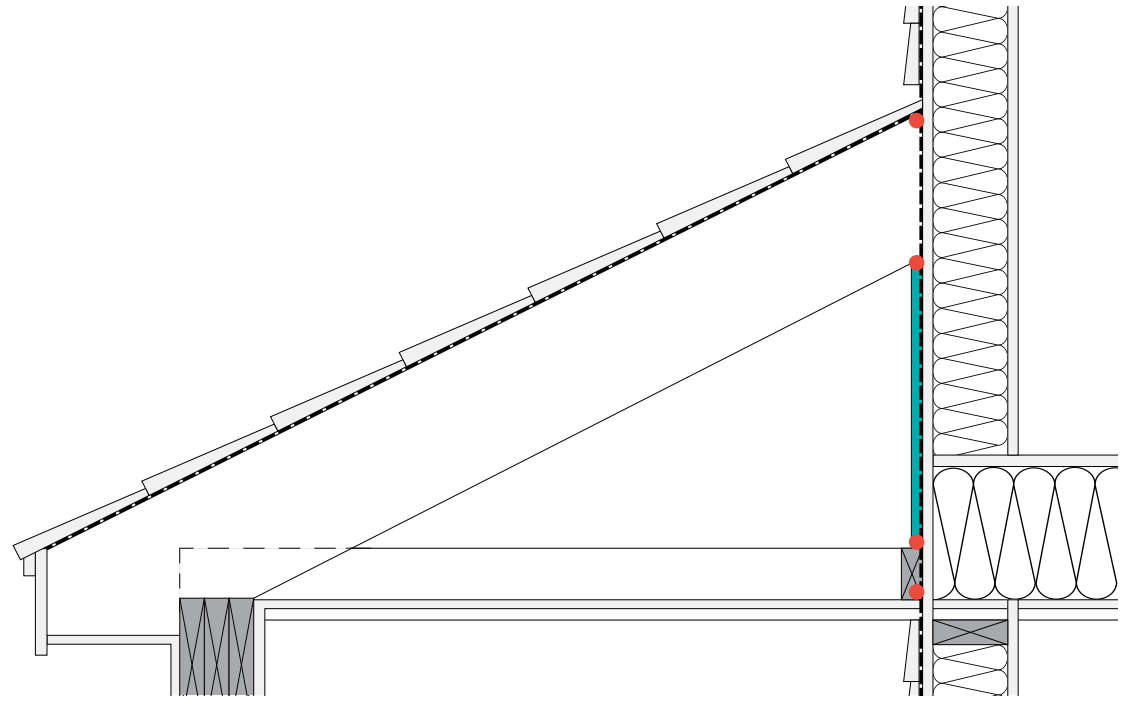
PORCH ROOF-WALL CONNECTION LEFT UNSHEATHED

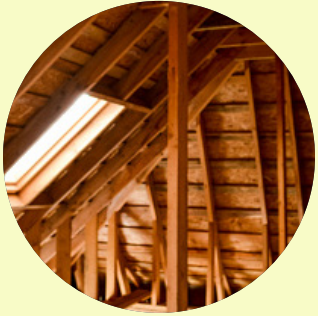
Problem

- In homes with covered porches, builders may sometimes forget to sheathe the wall area that will be hidden when the porch ceiling is installed, because the porch is framed before the wall sheathing is installed.

Solution

- Install a continuous exterior air barrier on the exterior wall cavity above the porch ceiling, air seal the perimeter, and fill the cavity with insulation.
- Seal all penetrations through conditioned area to porch overhang.





09. Gable Walls

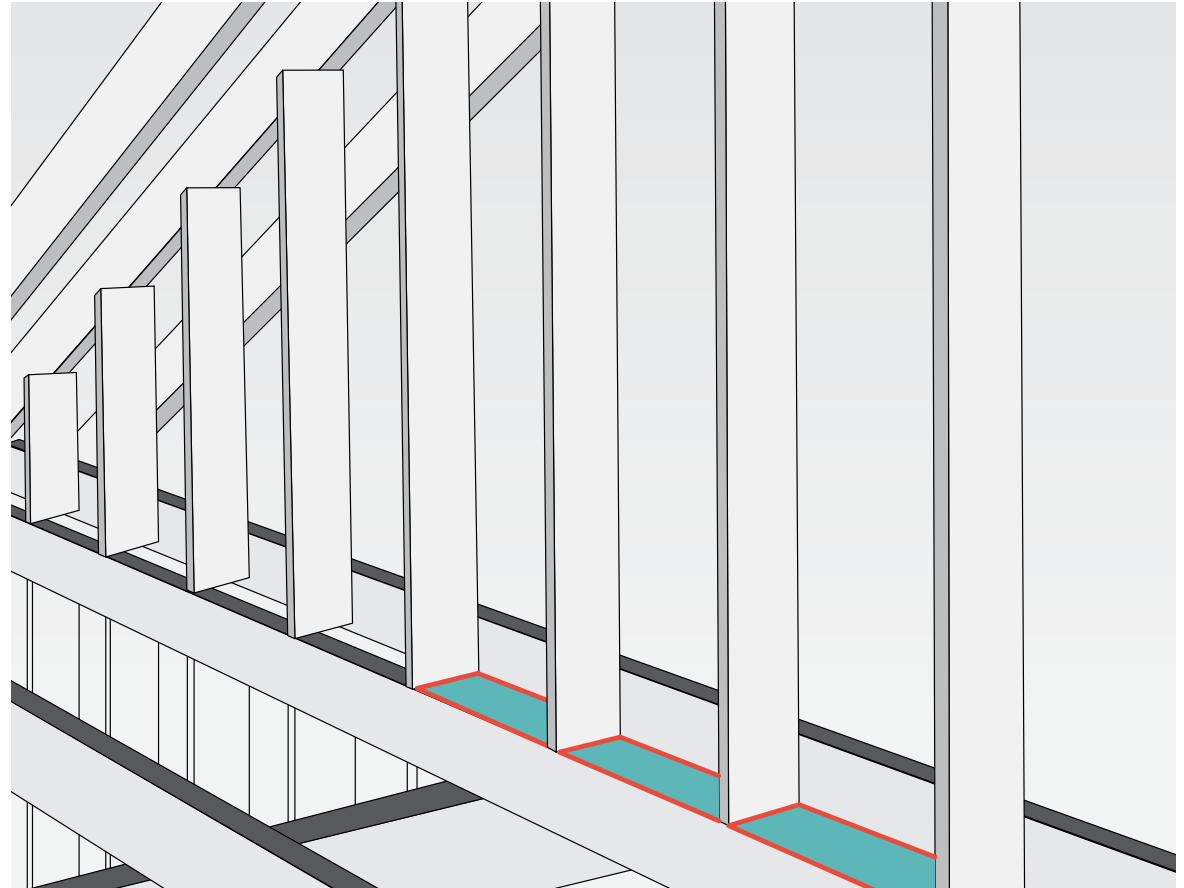
GABLE WALLS NOT PROPERLY SEALED

Problem

- Gaps are created where framing does not include a top plate at gable-ends.

Solution

- Fill the cavities with blocking at the ceiling plane and seal to prevent air flow between the attic and wall assembly.
- Seal at all top plate joints and around air barriers.





10.

House-Garage Connection

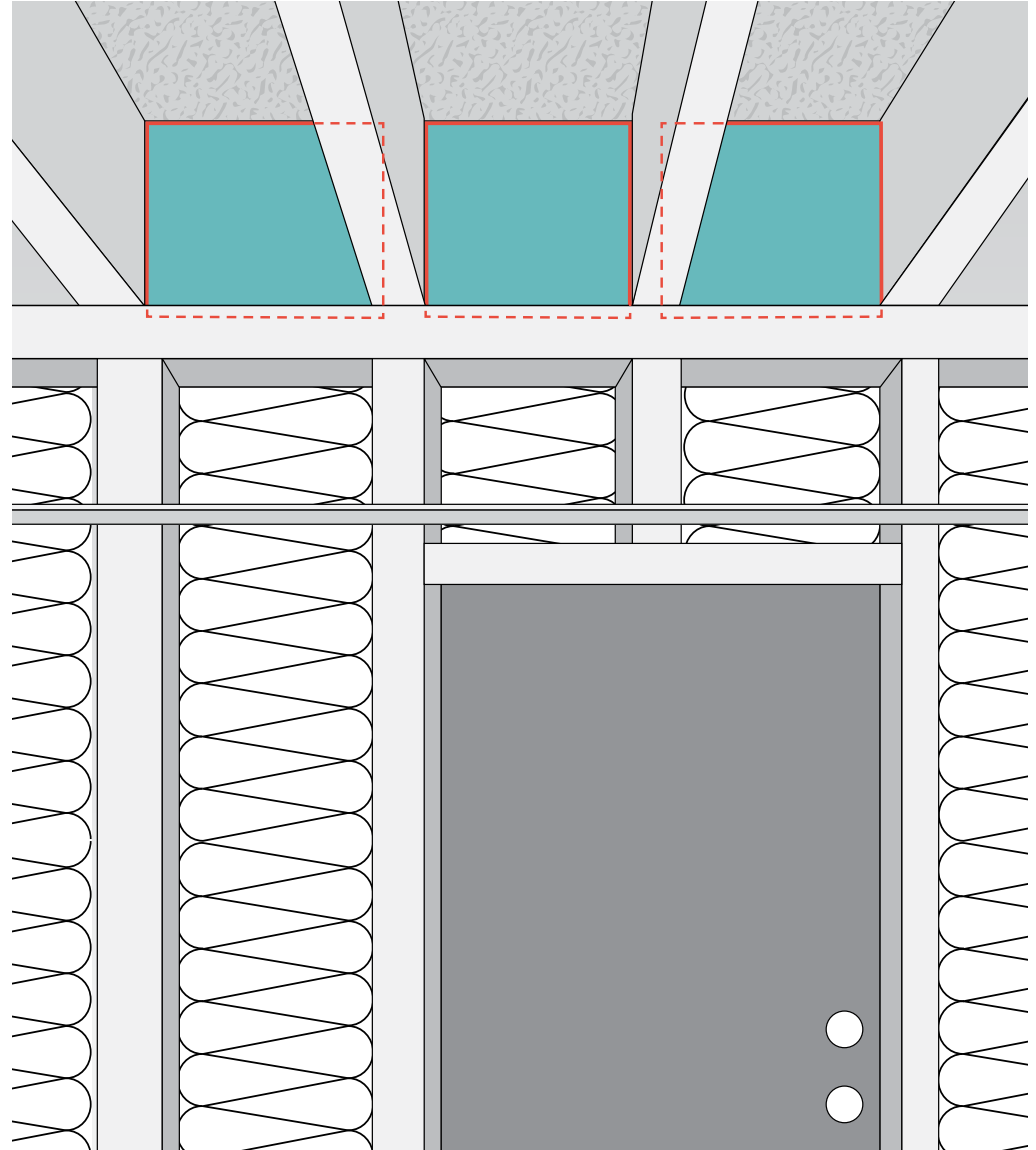
JOISTS IN GARAGE-HOUSE COMMON WALL LEFT OPEN

Problem

- Unsealed, though the joist cavities above the wall between the conditioned space and the garage can be a hidden path for air leakage.

Solution

- Install appropriate air barriers between each of the floor joists and seal edges prior to drywall installation to prevent air leakage.
- Closing this leakage path also helps to keep pollutants from cars and items stored in the garage from reaching the living space.





Efficient Ways to Improve Construction Quality

The simple blocking and air sealing measures detailed here aren't costly to complete as long as they're tackled at the right time. The key is preparing to address these paths as they're constructed, with builders putting processes in place to watch for and close these often insidious air flow paths. By incorporating the appropriate sealing measures as each location is constructed, builders can achieve marked reductions in air leakage and make substantial improvements to construction quality. These processes also make it far easier for builders to meet the latest testing requirements while maintaining profitability.

This summary is offered for informational purposes only. It does not purport to be an exhaustive analysis of code requirements or provide advice that will ensure guaranteed compliance with any energy code provision. Please consult with local authorities before finalizing your installation plans.

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