Detailing Guide for Heat Pump Penetrations in Existing Buildings

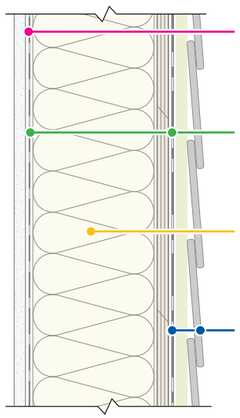
VERSION 1.1 | FEBRUARY 2025

About This Guide

This guide provides an overview of good installation and detailing methods for heat pump penetrations through walls in existing buildings. The penetration details provide a reference for how to detail typical line set, electrical wiring, and conduit components that penetrate through typical wall assemblies, while maintaining continuity of the building enclosure control layers.

Penetration detailing must include seals and water-shedding components to avoid compromising the existing assembly. Incorrect details can result in water leaks and significant air leakage, which can lead to damage to the building enclosure.

The detailing steps shown provide the necessary materials and components to maintain continuity of the control layers in the existing wall assembly as outlined below. See also the annotated diagram in Detail D-1A on page 5.



Vapour Control: Materials that prevent interior water vapour from getting into the assembly, typically the interior polyethylene sheet (poly).

Air Control: System of materials that prevent airflow through the assembly, typically including the interior poly sheet and/or the exterior sheathing membrane.

Thermal Insulation: Materials that slow down heat flow through the assembly, typically batt insulation in the stud cavity.

Water Control: Exterior layers that deflect and drain exterior water away from the assembly, typically the exterior cladding and the sheathing membrane.

Most line set details show the critical air control components installed from the exterior, with the conduit and interior components used to transfer back to the interior poly. This approach ensures consistent air control continuity regardless of which existing materials are intended as the air control layer(s).

Note that most details show penetrations made without requiring disassembly of the cladding or interior finishes. This retrofit approach provides easier installation methods but requires careful sequencing and sealing work as outlined in the Installation Best Practices on page 3.

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Authored by RDH Building Science

Heat Pump Retrofit Checklist

The details in this guide do not provide instructions beyond the penetrations through the existing enclosure. Before completing any heat pump retrofit installation work, ensure the following considerations have been addressed.

- ☐ Confirm that the building occupants/owners have permission to complete the work from the Authority Having Jurisdiction (AHJ) and the property administrator where applicable.
- ☐ Confirm if the heat pump retrofit installation requires an electrical permit, mechanical permit, and/or building permit, as well as involvement from a Registered Professional (typically required in most jurisdictions).
- ☐ Review the electrical planning report if applicable and complete an electrical load calculation to ensure there is enough capacity on the existing panel(s), or upgrade the electrical service/panel accordingly.
- ☐ Locate where the heat pump will drain directly to sewer drains (rather than to storm drains or as exterior runoff). Ensure appropriate drain line routing is possible.
- ☐ Confirm the heat pump outdoor unit location does not violate any city bylaws or development permit requirements for outdoor mechanical equipment, setbacks, or egress routes.
- ☐ Locate the unit(s)and penetrations to avoid long line set runs and tight loops.
- ☐ Confirm the products and detailing methods are acceptable to the Authority Having Jurisdiction (AHJ) when using this detailing guide.
- ☐ Take care to ensure that the existing enclosure components are in sound condition and adequately attached to the building before attempting to fasten or seal to them.
- ☐ Visit bchousing.org/research-centre/library for more resources and guidance.

See the Additional Resources list on page 4 for further guidance on best practices for penetration detailing and heat pump retrofit planning and installation.

Disclaimer

Detailing Considerations

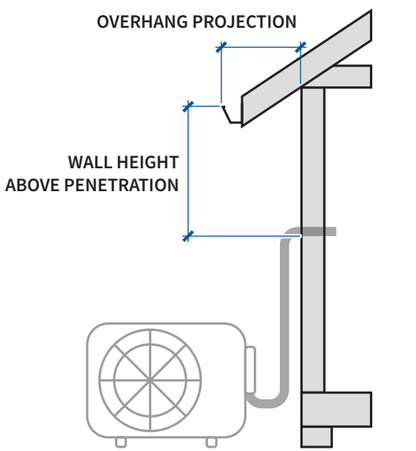
Penetrations in Low Exposure Areas

Reduce the risk of unintended water leakage at service penetrations by locating the holes in wall areas that are away from regular direct water exposure. Long-term direct rain and snow exposure can quickly degrade the penetration detailing and lead to damage of the wall assembly. Where possible, locate penetrations under overhangs or waterproof balconies, in alcoves and inset wall areas, and under existing wall flashing. If the wall area has obvious signs of discoloration from weathering or regular wetting patterns, it may not be appropriate to add a large penetration through it. When in doubt, use detailing for high exposure conditions as indicated in this guide.

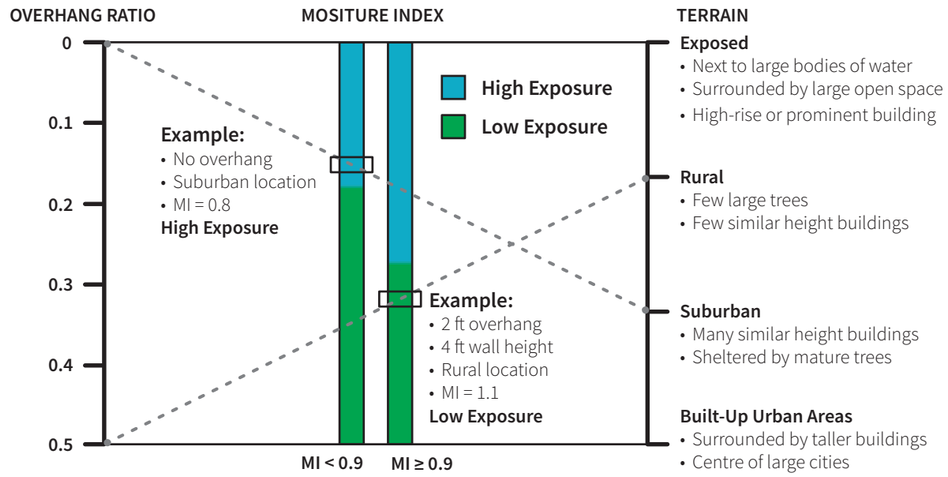
Exposure Risk Assessment With the Exposure Nomograph

The exposure risk can be broadly categorized as either low exposure or high exposure. The typical penetration details shown are intended for low exposure conditions since they do not typically include direct lapping into the existing water control layers or the use of dedicated deflection flashing. Use the following exposure nomograph to assess the exposure risk for a given wall area. See the Additional Resources list on page 4 for further guidance on assessing the exposure risk.

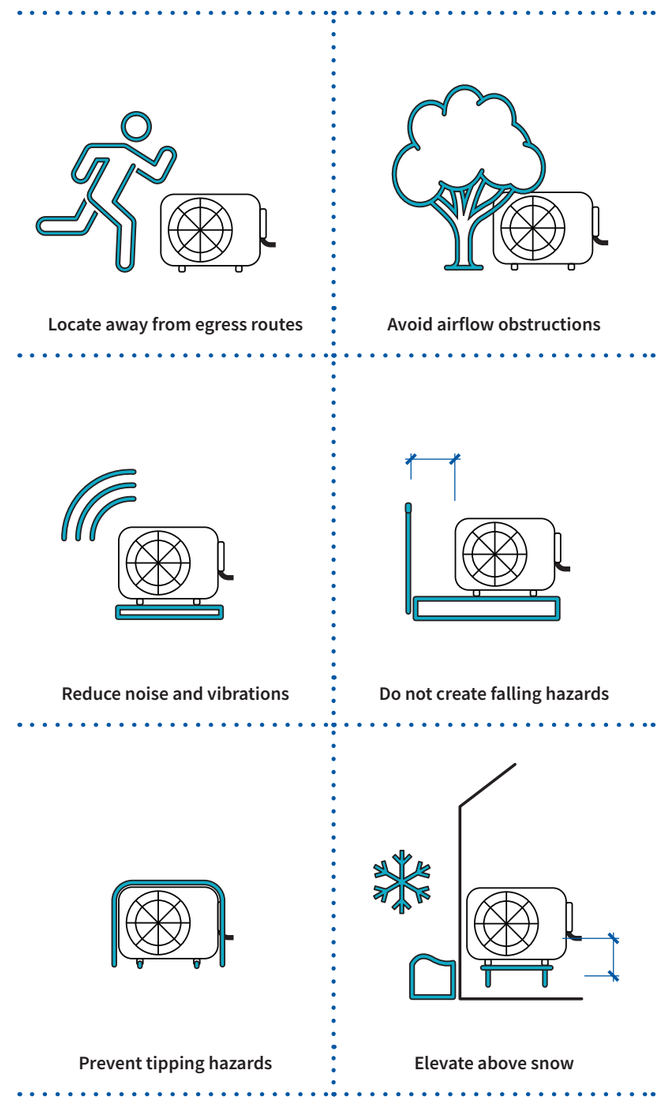
1. Calculate the Overhang Ratio for the penetration location on the wall (see below).
2. Choose the terrain category that best describes the building location.
3. Determine the Moisture Index (MI) for your location. The MI values for municipal locations are listed in Appendix C, Division B of the BCBC.
4. Draw a line between the exposure ratio and the terrain.
5. Identify the exposure risk based on the highest point where the line crosses the given Moisture Index bar.



$$\text{OVERHANG RATIO} = \frac{\text{OVERHANG PROJECTION}}{\text{WALL HEIGHT ABOVE PENETRATION}}$$



Other Heat Pump Outdoor Location Constraints



Detailing Considerations

Appropriate Materials and Components

The details in this guide show materials and components that can help simplify the installation process while ensuring continuity of the building enclosure control layers. Always confirm products and methods are acceptable to the Authority Having Jurisdiction.

- Commercial-grade construction sealant formulated for "low energy surface" materials (i.e., synthetic smooth surfaces that are otherwise often hard to adhere to) is usually a silicone-based product labelled as such. Consumer-grade sealant is typically not appropriate.
- Hard foam plastic backer rod helps keep the components in position when sealant is applied, where soft backer rod can deform and make it difficult to create a continuous seal.
- Adhesive line set tape is used to provide control layer continuity around the bundled line set. Use high-tack adhesive tape for wrapping the line set into a bundle. This includes conventional sheathing tape, "high-performance adhesive tape", and "stucco tape". Conventional woven line set wrap is not appropriate as a control layer transfer tape.
- Putty sealant is typically sold as "electrical putty", "duct putty", or "firestop putty". It usually comes as small bricks or pads.
- Unreinforced 60-mil EPDM roofing membrane is a flexible rubber material that can be sourced as individual patches or cut from full-size roofing membrane rolls. It should be cut using a sharp utility knife to avoid nicks.
- High-performance detailing tape is used to adhere and seal around EPDM. It is typically sold as "high-performance adhesive tape" specifically made for building detailing applications and often uses an acrylic-based adhesive.
- Solid schedule 20 PVC pipe, often termed "sewer pipe", is well-suited as line set conduit because it has thinner walls compared to schedule 40 pipe. Adjustable or multi-piece sleeve inserts that are not reliably air- and water-tight are not appropriate.
- Flanged duct collars can be sourced from HVAC suppliers and online general supply stores. As shown, they are sized to fit inside the conduit pipe and span out over the hole saw openings in the wall.
- Fire stopping accessories and sealant have not been specifically identified. Confirm with your Building Official and fire consultant before employing fire stopping materials.

Installation Best Practices

The detailing approaches shown require careful application. Detailing to ensure continuity of the enclosure control layers requires skill and experience.

1. Position the penetrations and outdoor unit so that the line set can be turned downward as it comes out to prevent water from tacking back to the opening.
2. Use hole saw guide plates and appropriate power drill tools to achieve clean consistent hole saw openings.
3. Slowly cut into rainscreen cladding to avoid damage to the sheathing membrane. Use an oscillating tool and a metal backing plate slipped behind the strapping when cutting against the sheathing membrane.
4. Clean all surfaces before applying sealant, tape or the EPDM gasket.
5. Apply sealant with a nozzle that has been cut to size to match the bead or opening size and use an adjustable or elbow nozzle where needed.
6. Tool the sealant beads to ensure continuous contact and a consistent profile.
7. Roll the sealant putty into cylinders so it is malleable and wrap it around each line before compressing it all together and wrapping it with tape.
8. Press the line set tape into place over all the areas to create a continuous well-adhered wrap around the line set.
9. Test fit the EPDM gasket before installing it. There should be a snug fit but without over-stretching the material around the component.
10. Bend and position the line set roughly before applying sealant. Avoid moving components excessively after the sealant has been installed.
11. Do not use spray foam to try to create a seal or for insulation.
12. Install deflection flashing and cover trim board to create a continuous water deflection surface over the cladding opening for high exposure areas.
13. Prioritize good quality control by documenting with photos and mid-point inspections where needed before the detailing gets covered up. Consider making a separate mock-up to practice the retrofit steps.
14. Remember that the penetration components may need to be removed for servicing and repair. Avoid excessive or messy sealant and consider leaving a record of the detailing approach used with the homeowner for their records.
15. Adapt the detailing for unique wall areas and penetrations through the rim joist but keep the same sealing approach mostly done from the exterior.

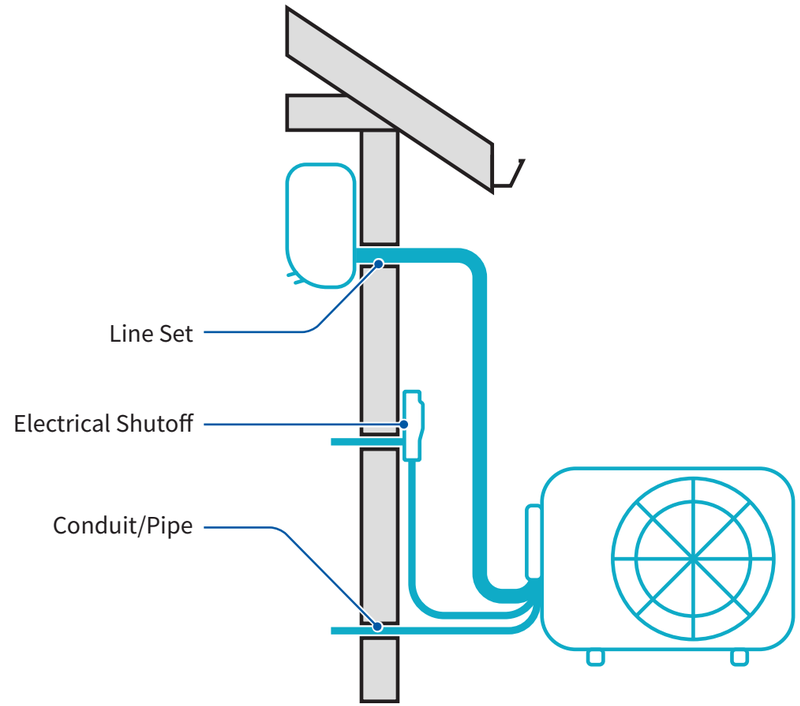
Firestopping for Openings in Fire-Rated Assemblies

The exterior walls of a building may require a fire resistance rating on the interior side due to proximity to property lines or adjacent buildings. This rating is applied on a percentage basis of the wall area. The allowable percentage of unprotected openings like doors, windows, and service penetrations through the wall is determined through the spatial separation requirements of the applicable building code. Where the permitted percentage of unprotected openings is maximized by the existing unprotected openings, fire protection of additional wall penetrations may be required. The protection of these additional penetrations is addressed by the fire stopping requirements of the applicable building code (i.e., typically Subsection 3.1.9. of the BCBC).

The specific configuration and components for this detailing can vary widely based on the type of penetration, the fire stopping requirements, and the products used. This guide includes one example detail with generic interior line set fire stopping based on currently available products. It does not specify installation procedures or required components. Fire stopping sealant is also referenced for each detail and in some cases implied in the graphics, but it is not to be relied upon for fire protection detailing or code compliance purposes. Always consult with your building official and a qualified fire protection consultant before making any changes to your building.

List of Heat Pump Retrofit Penetration Details

List of Details



Additional Resources

- Vancouver Building By-law (VBBL) 2019 | Queen's Printer for British Columbia | bccodes.ca
- British Columbia Building Code (BCBC) 2024 | King's Printer for British Columbia | bccodes.ca
- Building Envelope Guide for Houses - Part 9 Residential Construction | BC Housing | bchousing.org
- Building Enclosure Design Guide - Wood-Frame Multi-Unit Residential Buildings | BC Housing | bchousing.org
- City of Vancouver Heat Pump online resource page | vancouver.ca/mechanical-permit
- City of Vancouver Bulletin - Heat Pumps for Existing Ground-Oriented Dwellings | vancouver.ca/mechanical-permit
- City of Vancouver Bulletin - Installing a Heat Pump on Balconies and Decks | vancouver.ca/mechanical-permit
- LEEP Net Zero Energy Wall Guides - Appendix A: Building Material Product Selection Guide | natural-resources.canada.ca

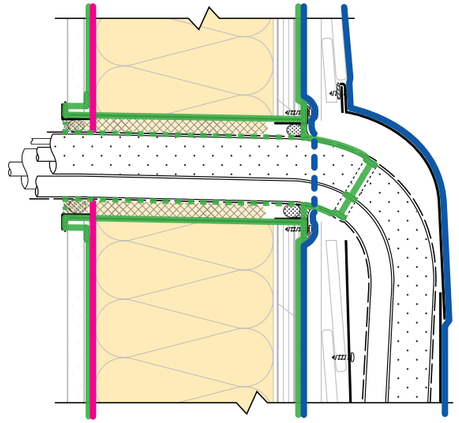
D-1A | Line Set Through Rainscreen Cladding

Materials (for typical line set sizes)

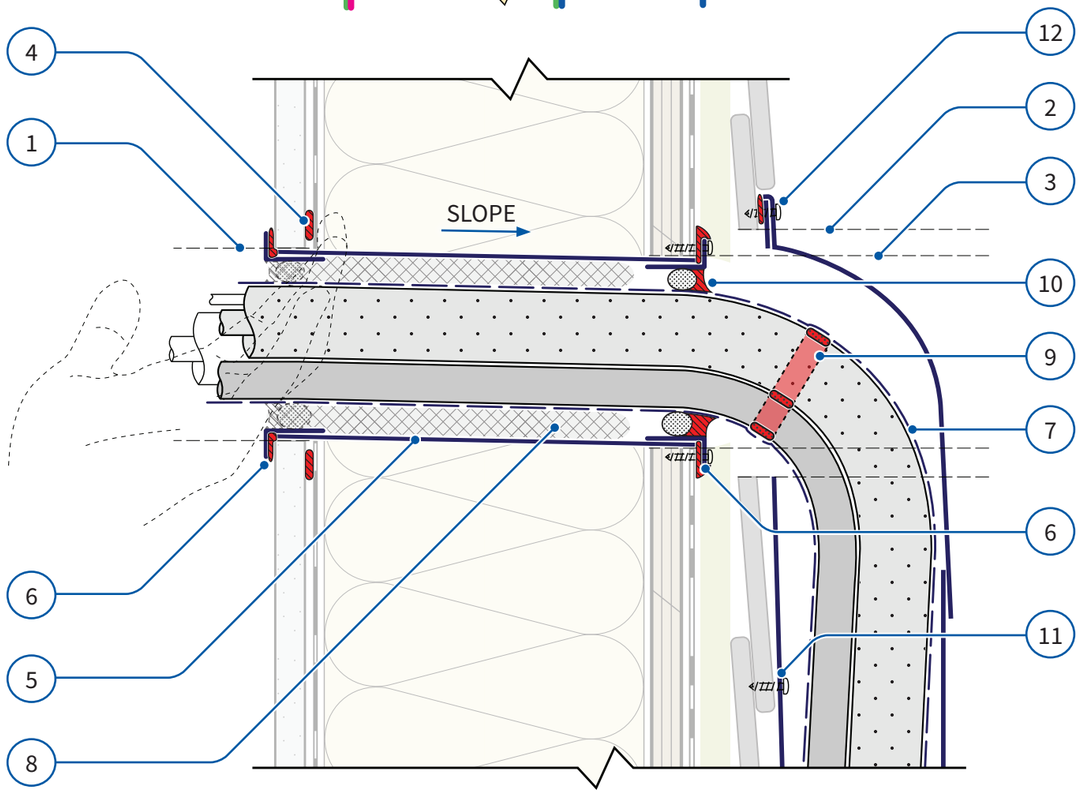
- 3" PVC conduit (schedule 20), 3" flanged duct collars
- Construction sealant for low surface energy materials, hard backer-rod
- Adhesive line set tape, putty sealant, line set cover kit

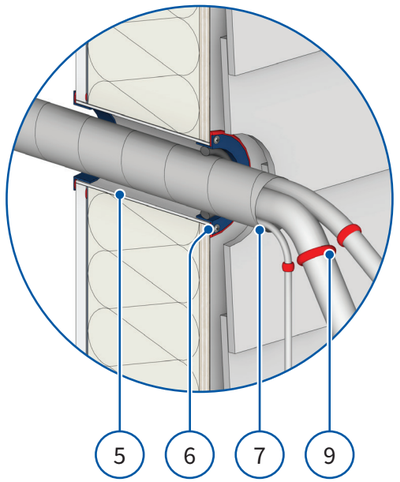
Steps (refer to Detailing Considerations on page 2)

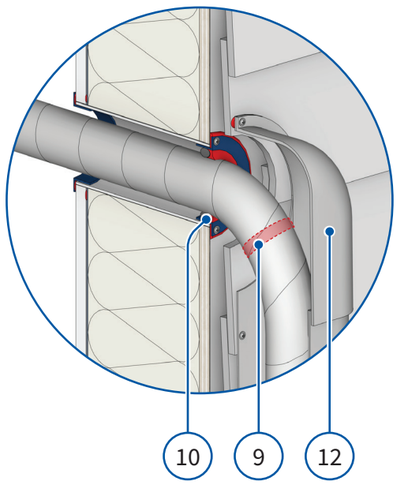
1. 3.25” hole saw opening in the interior finish and poly sheet, with a pilot hole to the exterior with a 2% downward slope.
2. 4.25" hole saw opening in the cladding, aligned with the pilot hole, made to avoid damage to the sheathing membrane where possible.
3. 3.25” hole saw opening in the sheathing membrane and sheathing (after the 4.25” hole in the cladding).
4. Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.
5. 3” PVC conduit cut to depth and inserted through the openings.
6. 3" duct collar set into sealant around the PVC conduit, interior finish, and at the exterior sheathing membrane, and fastened in place.
7. Line set inserted through the PVC conduit, with continuous line set tape over the portions within the conduit, and lines splayed to allow putty installation.
8. Hard backer rod baffle/insulation around the line set in the conduit as space and access permits.
9. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
10. Continuous hard backer-rod around the line set in the conduit and a continuous sealant bead tooled around the line set.
11. Line set cover receiver set into sealant on the cladding and fastened in place.
12. Line set cover clipped/fastened in place as needed.



- **Vapour Control**: PVC conduit, hard backer rod
- **Thermal Insulation:** Hard backer rod
- **Air Control**: Flanged duct collars, sealant, PVC conduit, line set tape, putty sealant
- **Water Control**: Flanged duct collar, sealant, line set tape, line set cover







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NOTES:

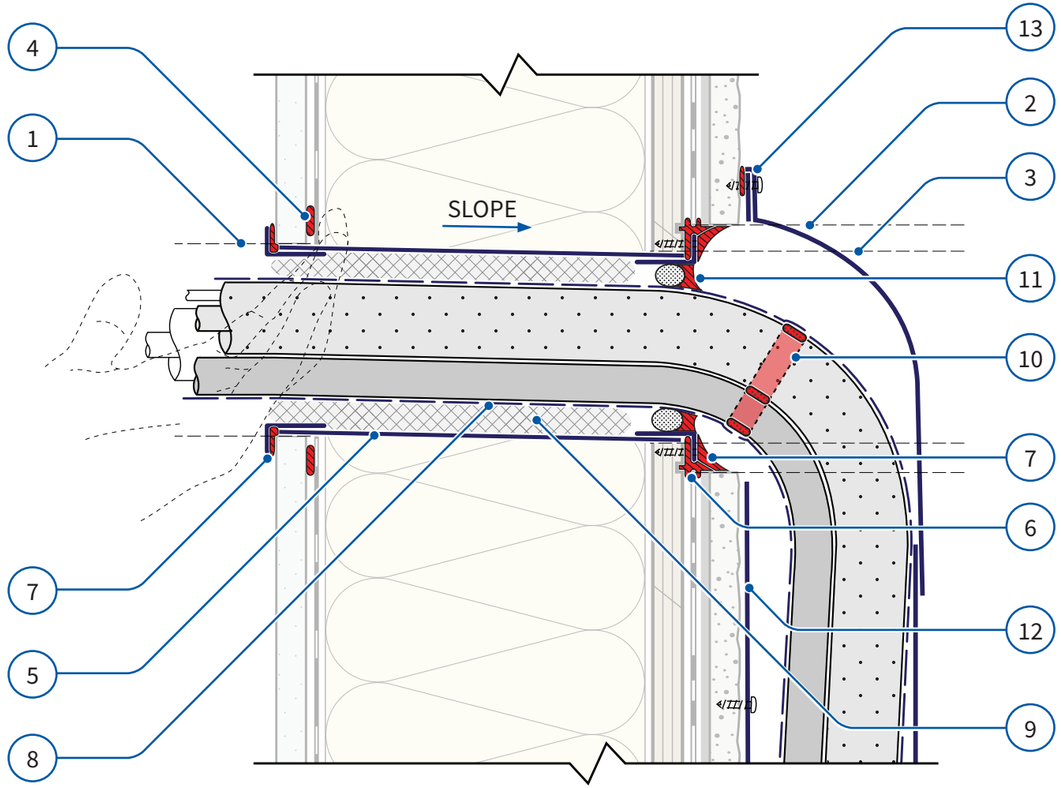
D-1B | Line Set Through Non-Rainscreen Cladding

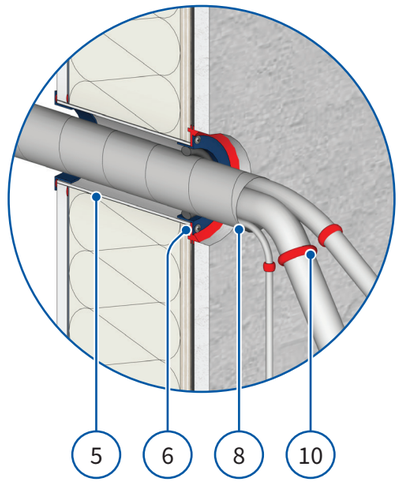
Materials (for typical line set sizes)

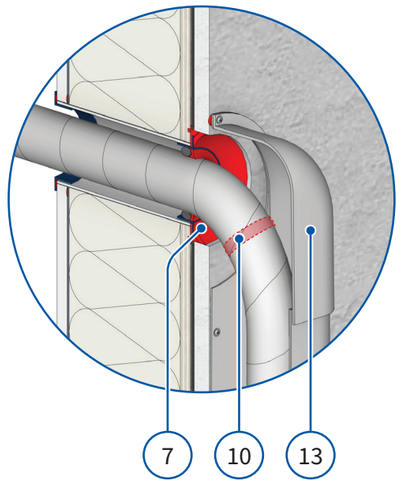
- 3" PVC conduit (schedule 20), 3" flanged duct collars
- Construction sealant for low surface energy materials, hard backer-rod
- Adhesive line set tape, putty sealant, line set cover kit

Steps (refer to Detailing Considerations on page 2)

1. 3.25” hole saw opening in the interior finish and poly sheet, with a pilot hole to the exterior with a 2% downward slope.
2. 4.25" hole saw opening in the cladding, aligned with the pilot hole.
3. 3.25” hole saw opening in the sheathing membrane and sheathing (after the 4.25” hole in the cladding).
4. Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.
5. 3” PVC conduit cut to depth and inserted through the openings.
6. Sealant tooled around the cladding opening and between the sheathing, membrane, and cladding. Temporary pry bar or shims used as needed to pull the cladding out for sealant access.
7. 3" duct collars with flanges set into sealant around the conduit, the interior finish and at the exterior, and fastened in place. Sealant tooled around the exterior duct collar.
8. Line set inserted through the PVC conduit, with line set tape only over the portions within the conduit, and lines splayed at the exterior to allow putty installation.
9. Hard backer rod baffle/insulation around the line set in the conduit as space and access permits.
10. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
11. Continuous hard backer-rod around the line set in the conduit and a continuous sealant bead tooled around the line set.
12. Line set cover receiver set into sealant on the cladding and fastened in place.
13. Line set cover clipped/fastened in place as needed.







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D-1C | Line Set Through EIFS Cladding

Materials (for typical line set sizes)

- 3" PVC conduit (schedule 20), 3" flanged duct collar
- Construction sealant for low surface energy materials, hard backer-rod
- High-performance detailing tape, unreinforced EPDM gasket membrane
- Compatible EIFS repair mortar with mesh reinforcing, mineral wool insulation block
- Adhesive line set tape, putty sealant, line set cover flashing

Steps (refer to Detailing Considerations on page 2)

1 3.25” hole saw opening in the interior finish and poly sheet and in the EIFS, with 2% downward slope to the exterior.

2 Rectangular opening in the EIFS with at least 2.5" clearance around the hole.

3 EIFS repair including reinforcing mesh applied over the exposed foam and at least 2" onto the face of the existing wall and EIFS on all sides.

4 Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.

5 3” PVC conduit cut to depth and inserted through the openings, and an EPDM membrane with an under-sized hole fit around the conduit (see sizing guide).

6 EPDM taped at all edges onto the new EIFS patch on the existing wall with high-performance detailing tape. Void infilled with insulation block cut to fit snugly.

7 3" duct collar with flanges set into sealant around the conduit and interior finish.

8 Line set inserted through the PVC conduit, with line set tape only over the portions within the conduit, and lines splayed at the exterior to allow putty installation.

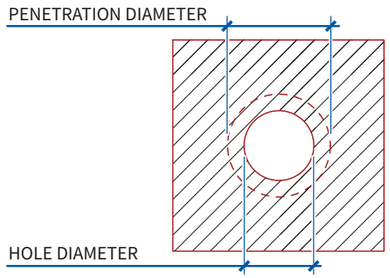
9 Hard backer rod baffle/insulation around the line set in the conduit as space and access permits.

10 Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.

11 Continuous hard backer-rod around the line set in the conduit and a continuous sealant bead tooled around the line set.

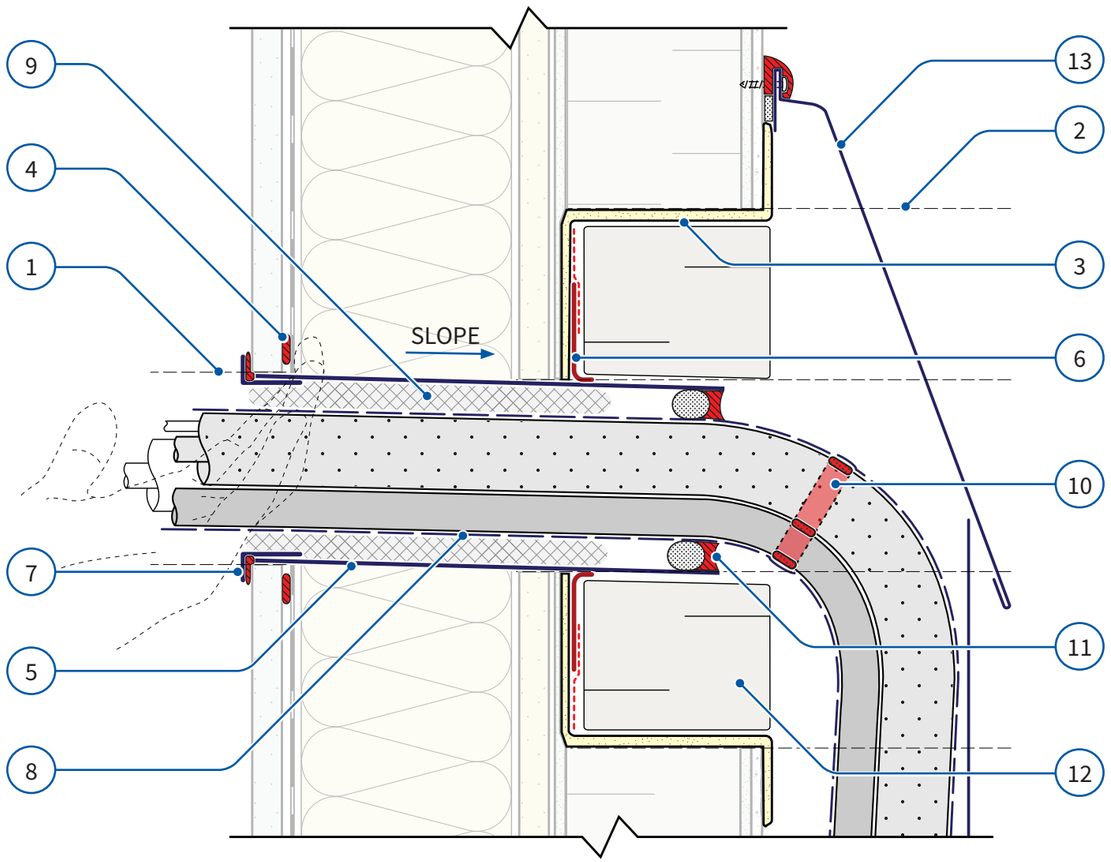
12 Replacement insulation block fitted around the line set, fastened in place as needed.

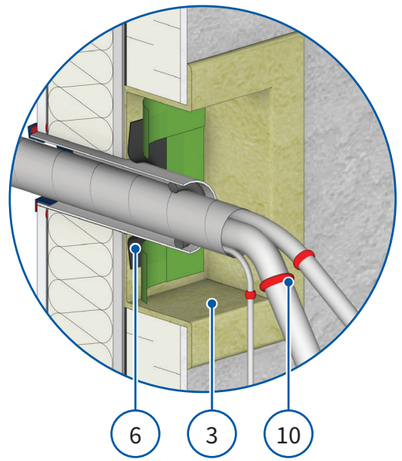
13 Line set cover flashing fastened on shims with sealant tooled at the top and sides and over the fasteners.

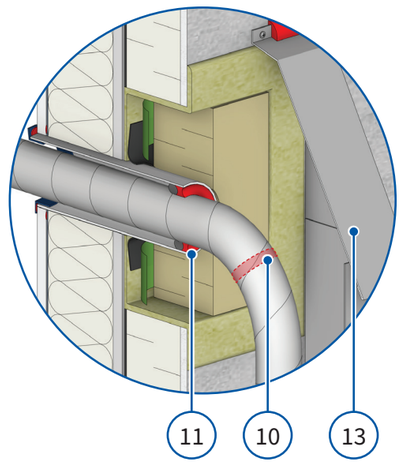


Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" - size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" - size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" - size hole diameter @ 1.5" smaller than the penetration diameter







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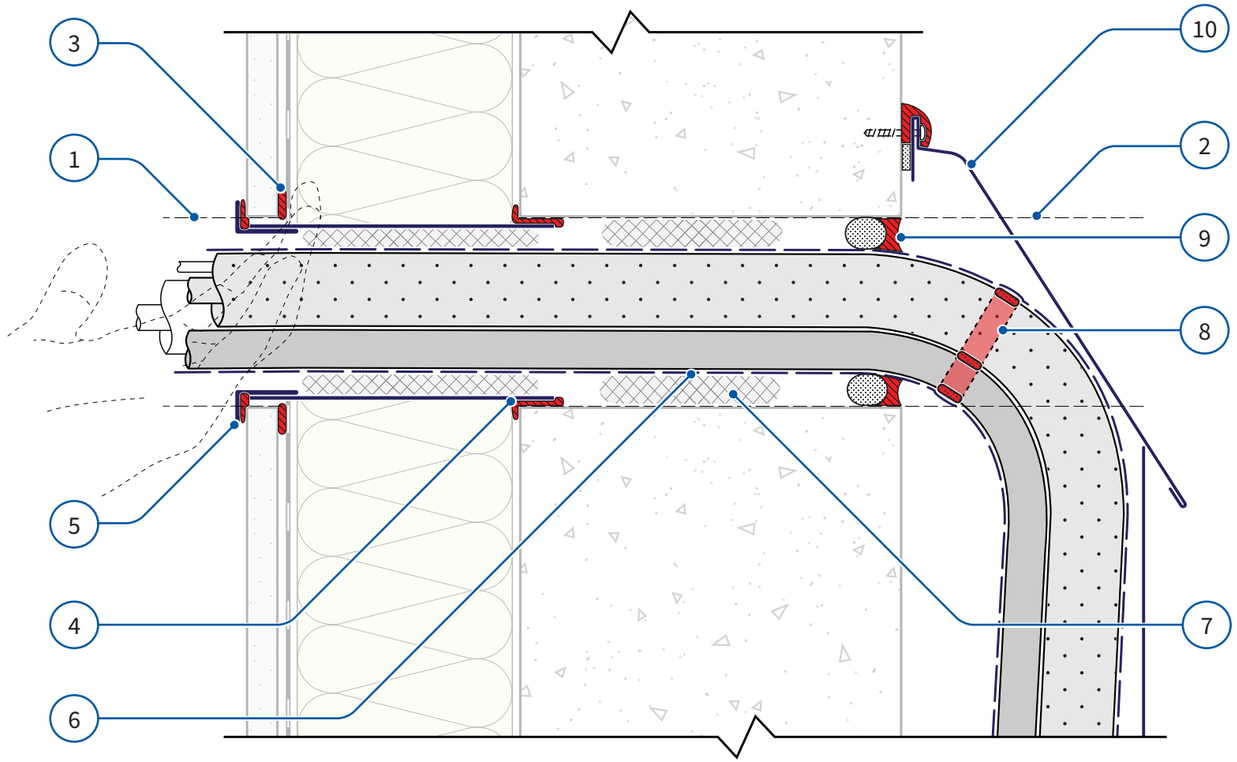
D-1D | Line Set Through Exposed Concrete

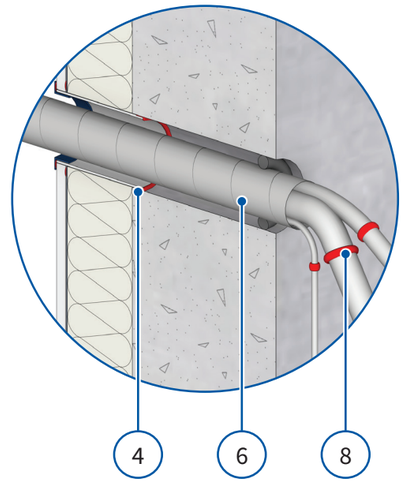
Materials (for typical line set sizes)

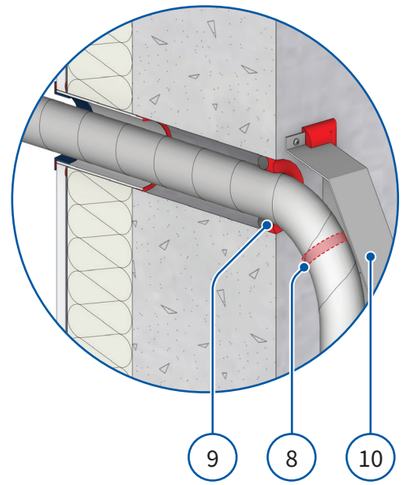
- 3" PVC conduit (schedule 20), 3" flanged duct collars
- Construction sealant for low surface energy materials, hard backer-rod
- Adhesive line set tape, putty sealant, line set cover flashing

Steps (refer to Detailing Considerations on page 2)

1. 3.25” hole saw opening in the interior finish and poly sheet, with a pilot hole to the exterior (sloped 2% if possible)
2. 3.25" cored opening through the concrete, aligned with the pilot hole.
3. Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.
4. 3” PVC conduit inserted through the interior opening and set into a sealant bead around the concrete cored opening.
5. 3" duct collar with flanges set into sealant around the conduit and interior finish.
6. Line set inserted through the opening, with line set tape only over the portions within the conduit/concrete, and lines splayed at the exterior to allow putty installation.
7. Hard backer rod baffle/insulation around the line set as space and access permits.
8. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
9. Continuous hard backer-rod around the line set in the concrete opening and a continuous tooled sealant bead around the line set.
10. Line set cover flashing fastened on shims and with sealant at the top and sides and over the fasteners.







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NOTES:

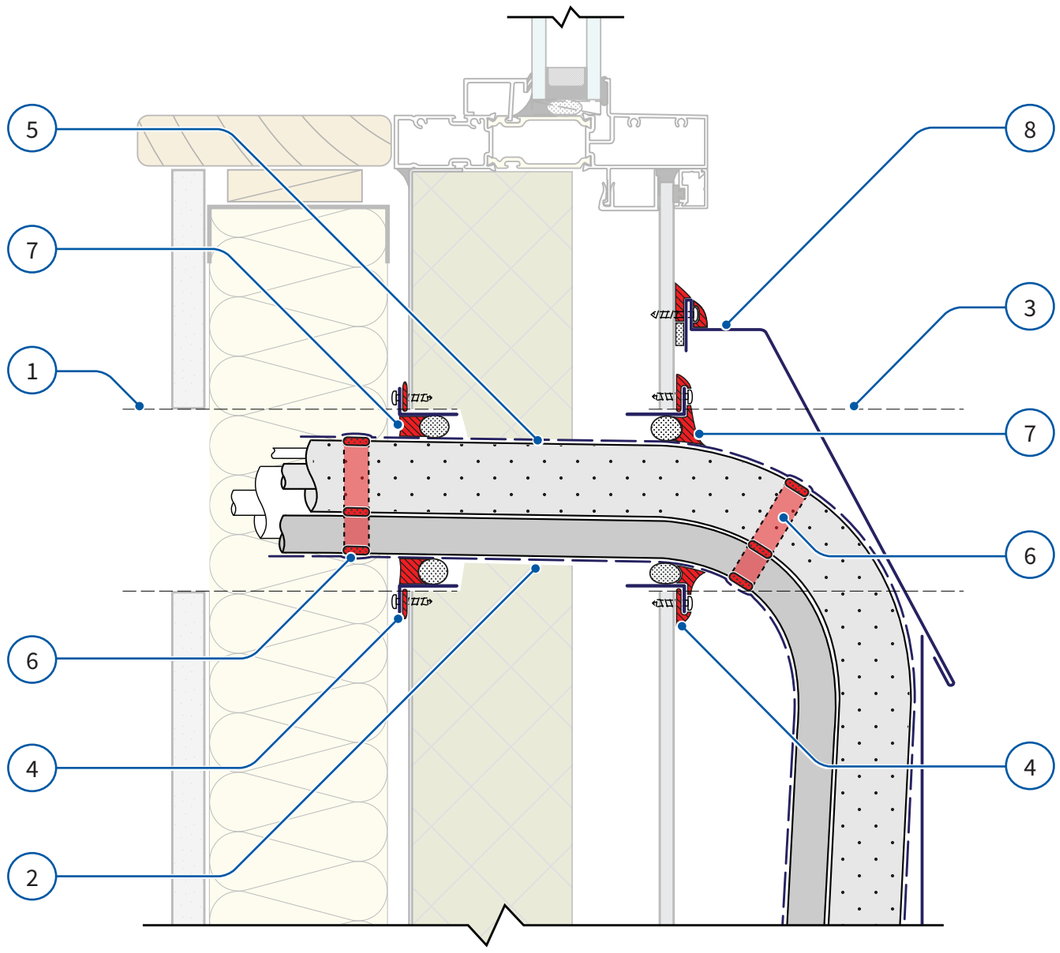
D-1E | Line Set Through Window Wall Spandrel

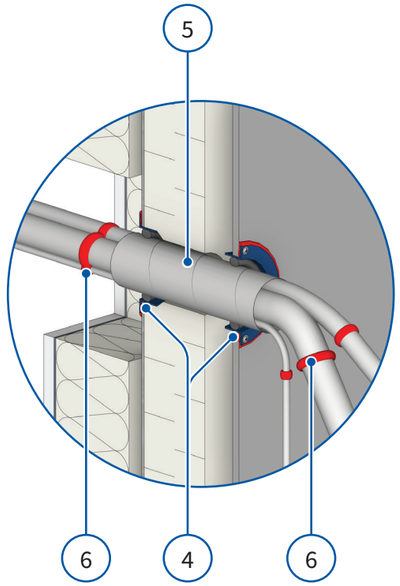
Materials (for typical line set sizes)

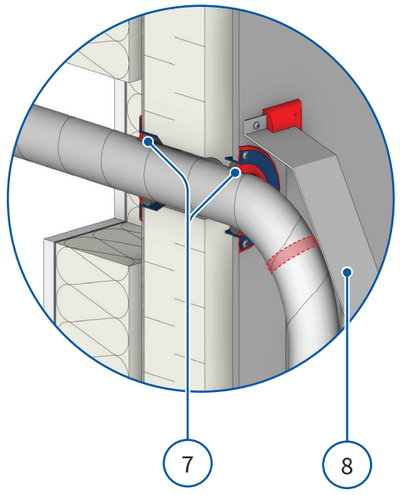
- 3" flanged duct collars
- Construction sealant for low surface energy materials, hard backer-rod
- Adhesive line set tape, putty sealant, line set cover flashing

Steps (refer to Installation Best Practices on Page 2)

1. 3” hole saw opening in the window wall backpan.
2. Spandrel insulation cored out to the diameter of the line set.
3. 3” hole saw opening in the window wall spandrel panel. If spandrel glass is used instead, replace it with an appropriate panel that can receive a hole saw opening, such as a metal sandwich panel.
4. Duct collars with flanges set into sealant at the interior of the backpan and at the exterior of the spandrel panel, and fastened in place as needed.
5. Line set inserted through the duct collars, with line set tape only over the portions within the spandrel space, and lines splayed at the interior and exterior to allow putty installation.
6. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
7. Continuous hard backer-rod around the line set in the duct collars and continuous sealant beads tooled around the line set.
8. Line set cover flashing fastened on shims with sealant tooled at the top and sides and over the fasteners.







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NOTES:

D-1F | Line Set Through Exterior-Insulated or Deep Rainscreen

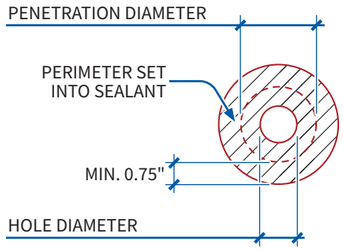
VERSION 1.1 | FEBRUARY 2025

Materials (for typical line set sizes)

- 3" PVC conduit (schedule 20), 3" flanged duct collars
- Construction sealant for low surface energy materials, hard backer-rod
- Adhesive line set tape, putty sealant, line set flashing/cover kit

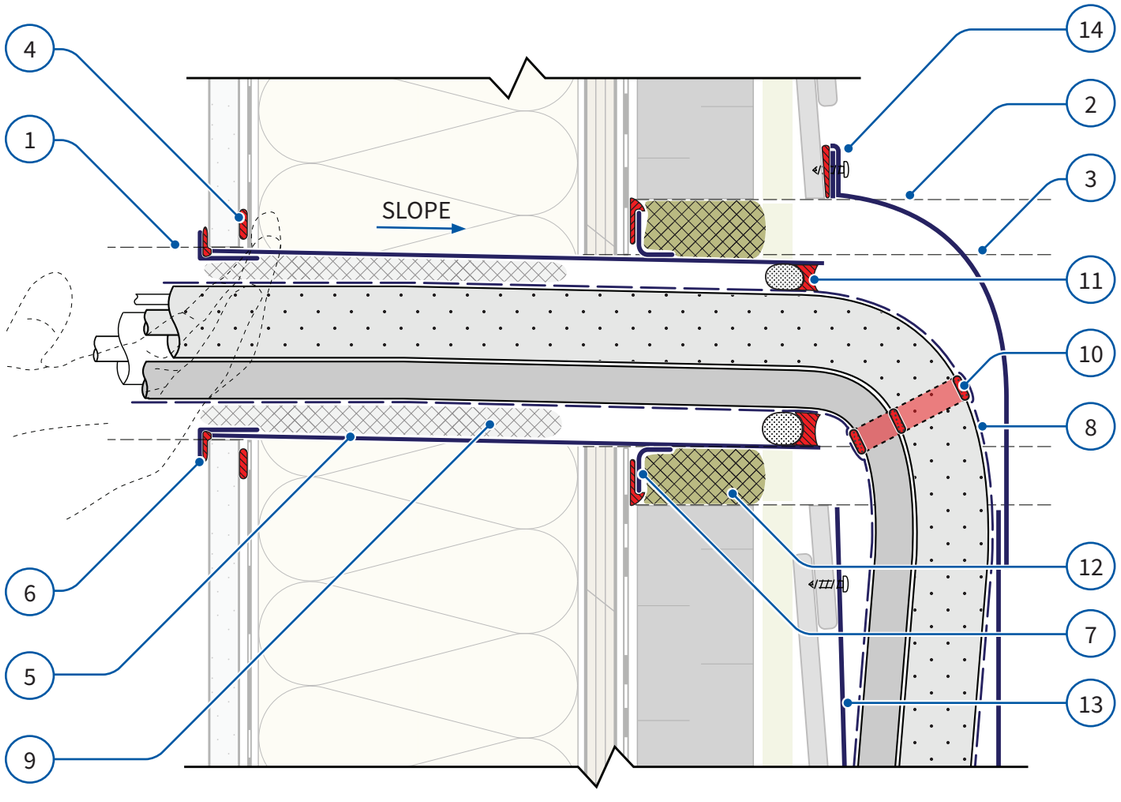
Steps (refer to Detailing Considerations on page 2)

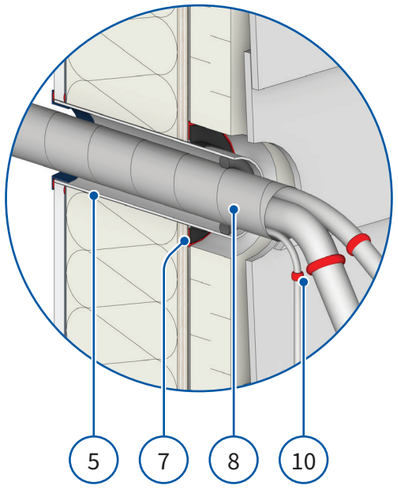
1. 3.25” hole saw opening in the interior finish and poly sheet, with a pilot hole to the exterior with a 2% downward slope.
2. 5" hole saw opening in the cladding and exterior insulation, aligned with the pilot hole, made to avoid damage to sheathing membrane where possible.
3. 3.25” hole saw opening in the sheathing membrane and sheathing (after the 5” hole in the cladding and insulation).
4. Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.
5. 3” PVC conduit cut to depth and inserted through the openings.
6. 3" interior duct collar set into sealant around the PVC conduit and interior finish, and fastened in place as needed.
7. Circular EPDM membrane with an under-sized hole fit around the conduit and carefully set into a continuous bead of sealant on the sheathing membrane around the hole (see sizing guide at top right).
8. Line set inserted through the PVC conduit, with continuous line set tape over the portions within the conduit, and exposed lines splayed to allow putty installation.
9. Hard backer rod baffle/insulation around the line set in the conduit as space and access permits.
10. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
11. Continuous hard backer-rod and sealant bead tooled around the line set in the conduit.
12. Semi-rigid mineral wool insulation fitted around the line set, pinned in place as needed.
13. Line set cover receiver set into sealant on the cladding and fastened in place.
14. Line set cover clipped/fastened in place as needed.

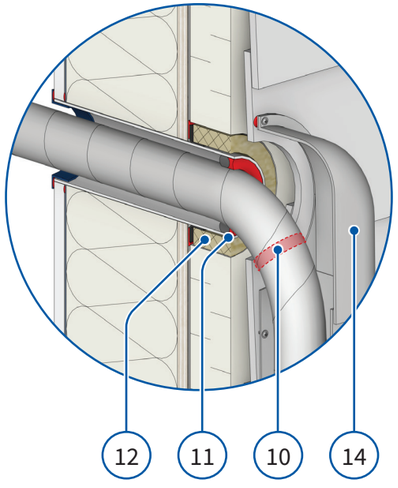


Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" – size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" – size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" – size hole diameter @ 1.5" smaller than the penetration diameter







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PENETRATION LOCATION:

NOTES:

D-1G | Line Set Through Rainscreen in High Exposure and/or Firestopping Conditions

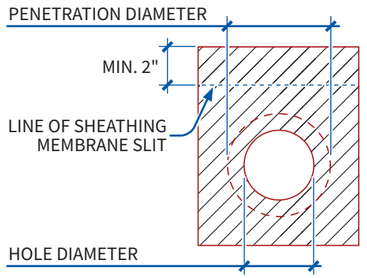
VERSION 1.1 | FEBRUARY 2025

Materials (for typical line set sizes)

- 3" PVC conduit (schedule 20), firestopping accessories
- Construction sealant for low surface energy materials, hard backer-rod
- High-performance detailing tape, unreinforced 60 mil EPDM gasket membrane
- Adhesive line set tape, putty sealant, trim board, flashing, and line set cover kit

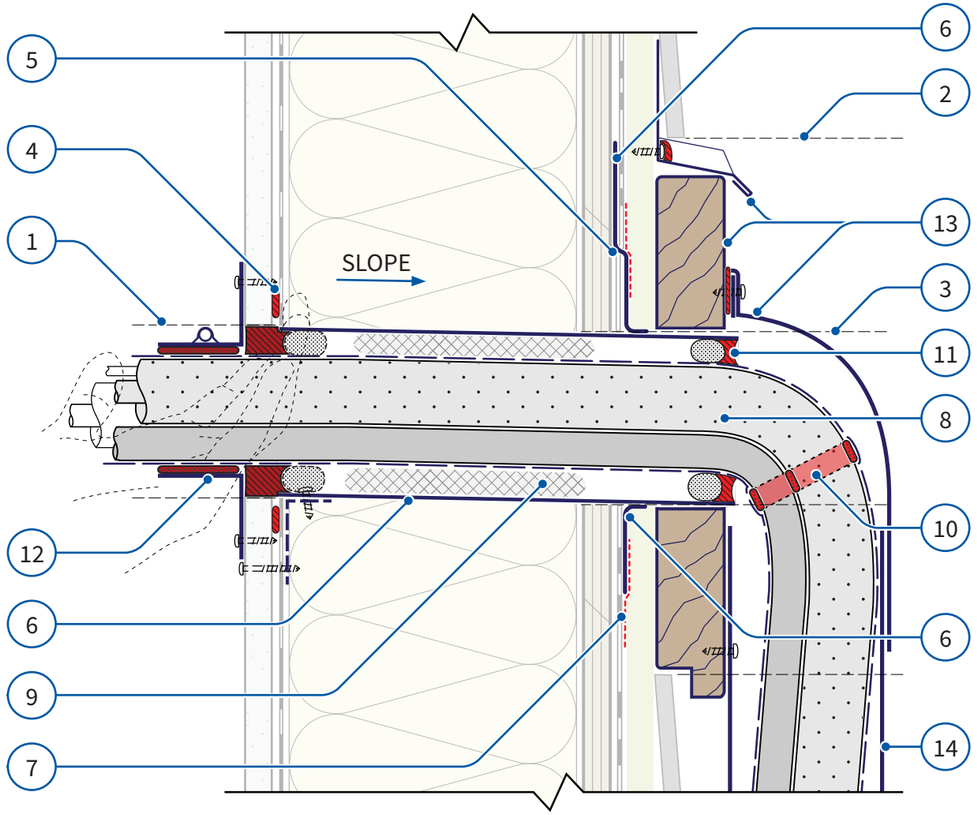
Steps (refer to Detailing Considerations on page 2)

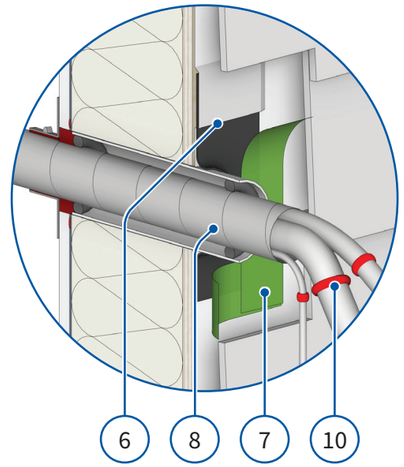
1. 3.25” hole saw opening in the interior finish and poly sheet, with a pilot hole to the exterior with a 2% downward slope.
2. Rectangular opening in the cladding around the pilot hole, avoiding damage to the sheathing membrane.
3. 3.25” hole saw opening in the sheathing membrane and sheathing.
4. Sealant tooled between the interior poly sheet and the interior finish around the perimeter of the hole.
5. Horizontal slit cut through the sheathing membrane to the width of the EPDM patch and located above the new hole saw opening to allow lapping and taping of the EPDM patch (see Step 6).
6. 3” PVC conduit sized to fit inset from the interior finish (supported as needed) and aligned with the new trim board (see Step 13). EPDM membrane with an under-sized hole fit around the conduit at the exterior and with its top edge slipped behind the sheathing membrane through the slit from Step 5 (see sizing guide at top right).
7. All edges of the EPDM patch taped onto the sheathing membrane with high-performance detailing tape.
8. Line set inserted through the PVC conduit, with continuous line set tape over the portions within the conduit, and lines splayed to allow putty installation.
9. Hard backer rod baffle/insulation around the line set in the conduit as space and access permits.
10. Continuous putty "rings" around each line to make them airtight when ganged together, and line set tape continued over the putty rings to compress them in place.
11. Continuous hard backer-rod and sealant bead tooled around the line set in the conduit.
12. Interior firestopping sealant and collar detailing as required (see Firestopping on page 3).
13. Flashing and trim board fastened in place on furring as needed. Sealant tooled at the sides of the trim board. Line set cover components set into sealant and clipped/fastened in place.

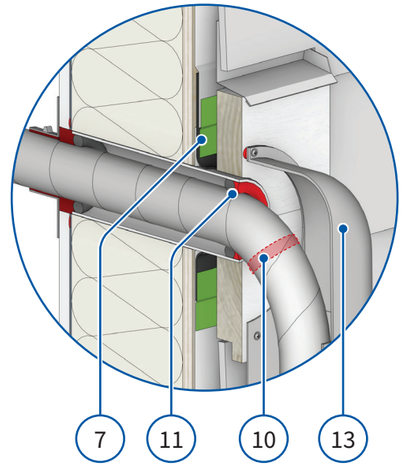


Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" – size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" – size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" – size hole diameter @ 1.5" smaller than the penetration diameter







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D-2A | Electrical Disconnect Box on Rainscreen Cladding

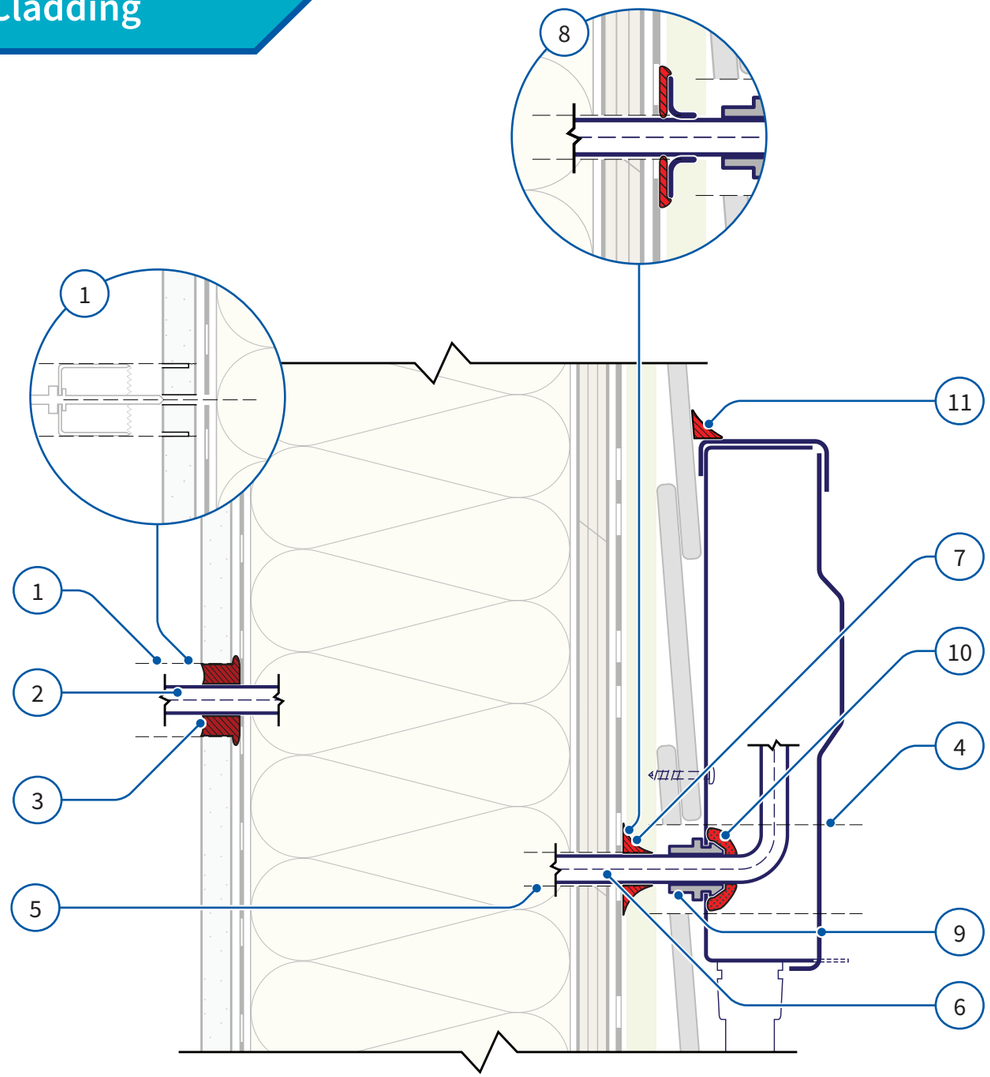
VERSION 1.1 | FEBRUARY 2025

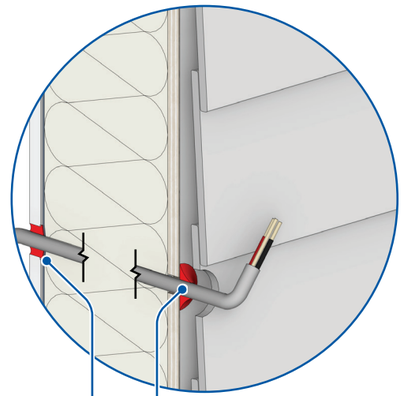
Materials

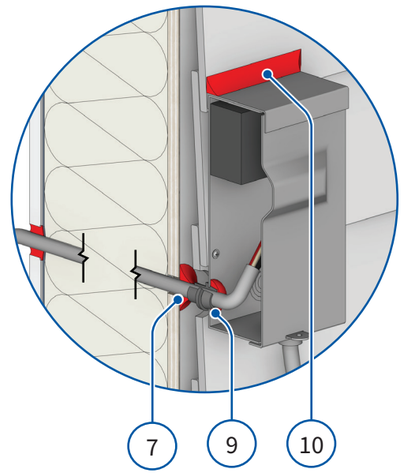
- Electrical wiring, disconnect box, snap-in cable connector
- Construction sealant for low surface energy materials
- Putty sealant, firestopping accessories
- Unreinforced 60 mil EPDM gasket membrane (optional)

Steps (refer to Detailing Considerations on page 2)

1. 1.25” hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut.
2. Wire inserted through the hole saw pilot hole in the poly and restrained with fasteners or putty sealant as needed to centre the wire in the opening.
3. Sealant (firestopping if necessary) tooled around the wire, using the exposed poly as backer, to fully fill the opening in the interior finish.
4. For the exterior penetration, 1.5" hole saw opening in the cladding, avoiding damage to sheathing membrane where possible.
5. Hole matching the diameter of the electrical wire drilled through the sheathing membrane and sheathing (after the 1.5” hole in the cladding).
6. Wire inserted through the hole and restrained as needed, with its final position centred in the opening.
7. Sealant tooled around the wire and onto the sheathing membrane. See also the D-3 details for detailing options if the penetration is not covered by the disconnect box.
8. Optional wire penetration sealing approach using EPDM (see also D-1F): Circular EPDM membrane with an under-sized hole fit around the wire and carefully set into a continuous bead of sealant on the sheathing membrane around the wire hole.
9. Disconnect box with snap-in connector fitted over the wire and fastened in place, with the connector positioned in the 1.5" opening.
10. Putty sealant around the wire at the connector within the disconnect box to reduce water tracking back to the sheathing membrane.
11. Sealant tooled at the top and side of the disconnect box or flashing as needed.







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D-2B | Electrical Disconnect Box on Non-Rainscreen Cladding

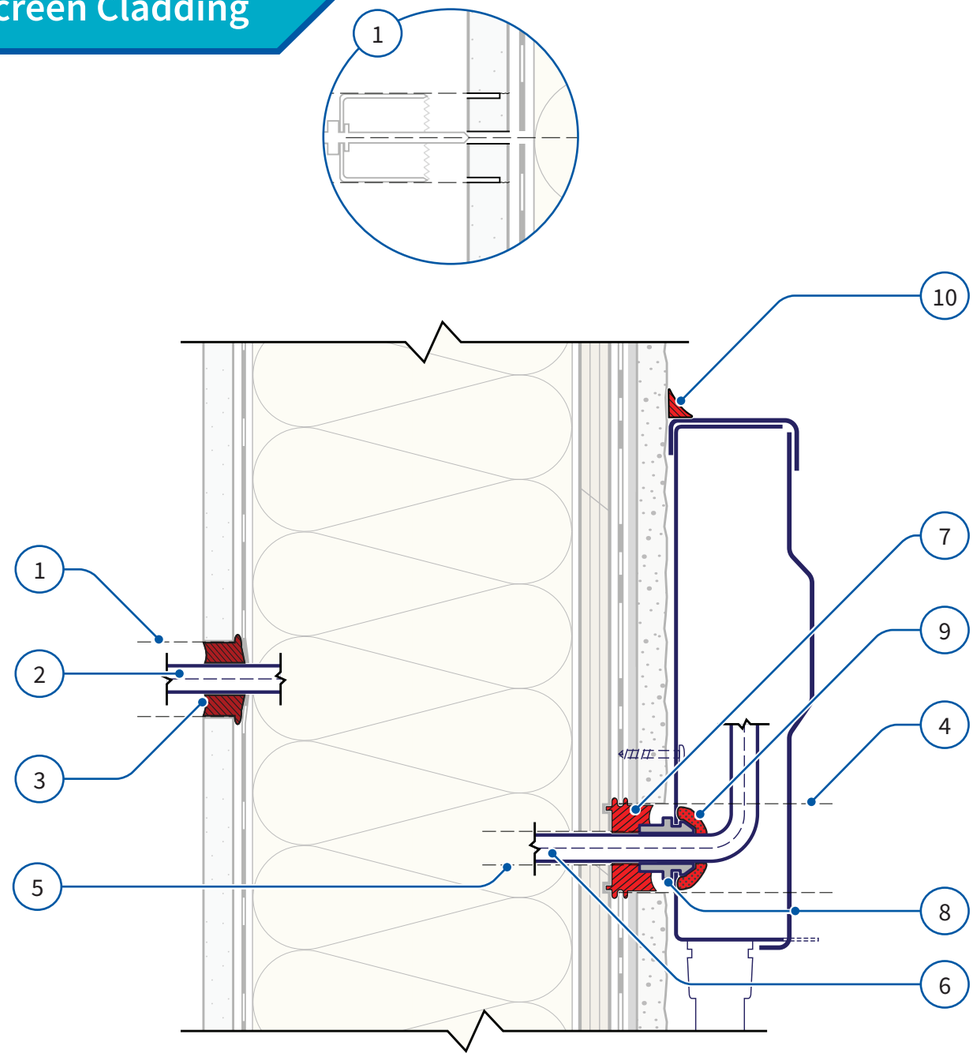
VERSION 1.1 | FEBRUARY 2025

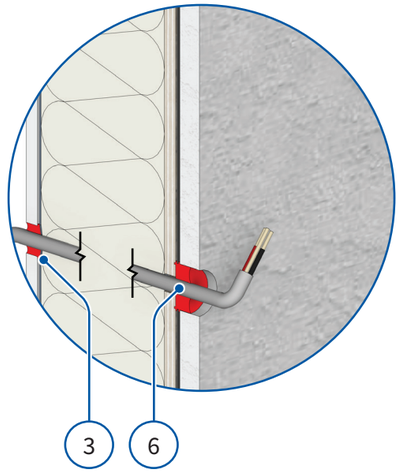
Materials

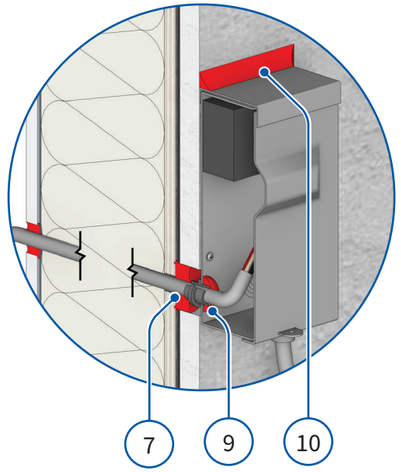
- Electrical wiring, disconnect box, snap-in cable connector
- Construction sealant for low surface energy materials
- Putty sealant, firestopping accessories

Steps (refer to Detailing Considerations on page 2)

1. 1.25” hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut.
2. Wire inserted through the hole saw pilot hole in the poly and restrained with fasteners or putty sealant as needed to centre the wire in the opening.
3. Sealant (firestopping if necessary) tooled around the wire, using the exposed poly as backer, to fully fill the opening in the interior finish.
4. For the exterior penetration, 1.5" hole saw opening in the cladding and membrane, with a 0.125" kerf cut into the sheathing.
5. Hole matching the diameter of the wire drilled through the sheathing membrane and sheathing (after the 1.5” hole in the cladding).
6. Wire inserted through the hole and restrained as needed to centre it in the opening.
7. Sealant tooled around the wire onto the sheathing to fully fill the opening, including into the kerf and around the edge of the membrane and cladding where possible.
8. Disconnect box with snap-in connector fitted over the wire and fastened in place, with the connector centered in the 1.5" hole opening.
9. Putty sealant around the wire at the connector within the disconnect box.
10. Sealant at the top and sides of the disconnect box.







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D-2C | Electrical Disconnect Box on Rainscreen Cladding in High Exposure Conditions

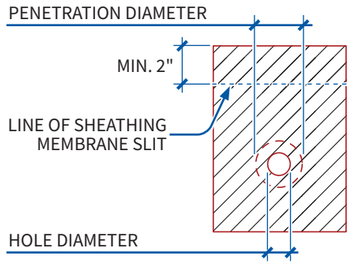
VERSION 1.1 | FEBRUARY 2025

Materials

- Electrical wiring, disconnect box, snap-in cable connector
- Construction sealant for low surface energy materials
- High-performance detailing tape, unreinforced 60 mil EPDM gasket membrane
- Putty sealant, firestopping accessories, trim board, flashing

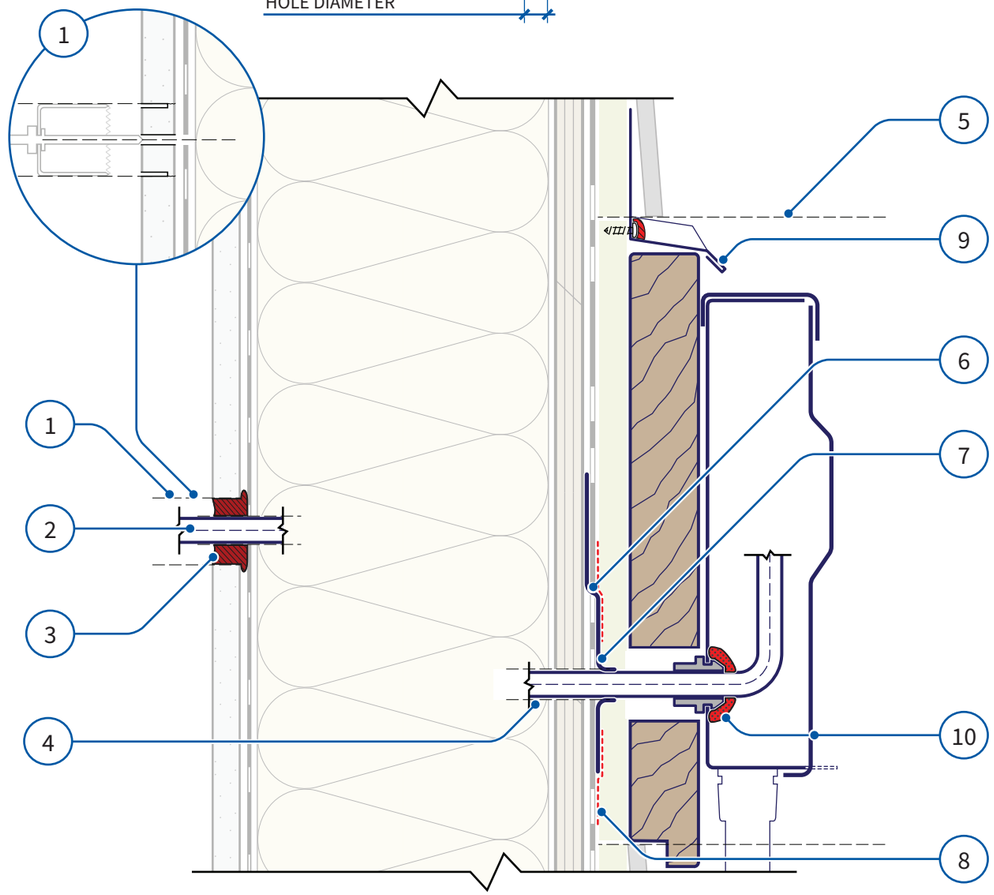
Steps (refer to Detailing Considerations on page 2)

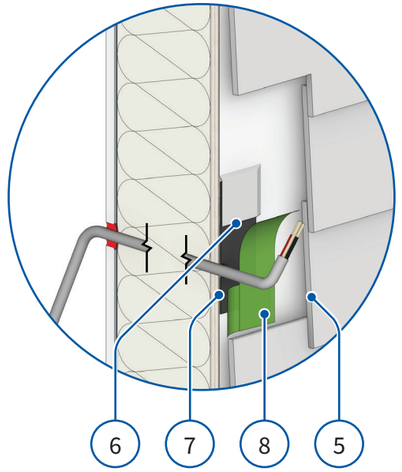
1. 1.25” hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut.
2. Wire inserted through the hole saw pilot hole in the poly and restrained with fasteners or putty sealant as needed to centre the wire in the opening.
3. Sealant (firestopping if necessary) tooled around the wire, using the exposed poly as backer, to fully fill the opening in the interior finish.
4. Hole matching the diameter of the wire drilled through the cladding, sheathing membrane, and sheathing.
5. Rectangular opening in the cladding with at least 3" clearance around the wire hole and tall enough to receive the backing trim board and flashing (see Step 9), avoiding damage to the sheathing membrane and removing furring strips as needed.
6. Horizontal slit cut through the sheathing membrane to the width of the EDPM patch and located above the wire hole to allow lapping and taping of the EPDM patch (see Step 7).
7. EPDM membrane with an under-sized hole fit over the electrical wire at the exterior and with its top edge slipped behind the sheathing membrane in the slit from Step 6 (see sizing guide at top right).
8. All edges of the EPDM patch taped onto the sheathing membrane with high-performance detailing tape.
9. Flashing and trim board fastened in place on furring as needed. Sealant tooled at the sides of the trim board.
10. Disconnect box with snap-in connector fitted over the wire and fastened in place. Fire putty around the wire at the connector to reduce water tracking back along the wire.

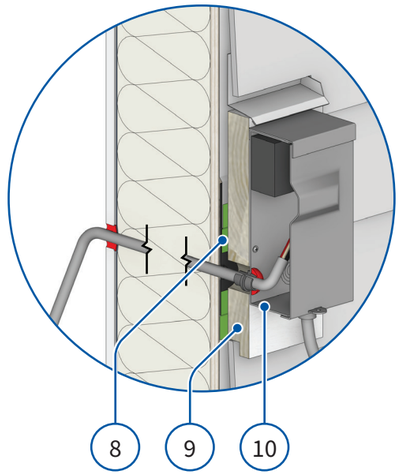


Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" – size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" – size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" – size hole diameter @ 1.5" smaller than the penetration diameter







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NOTES:

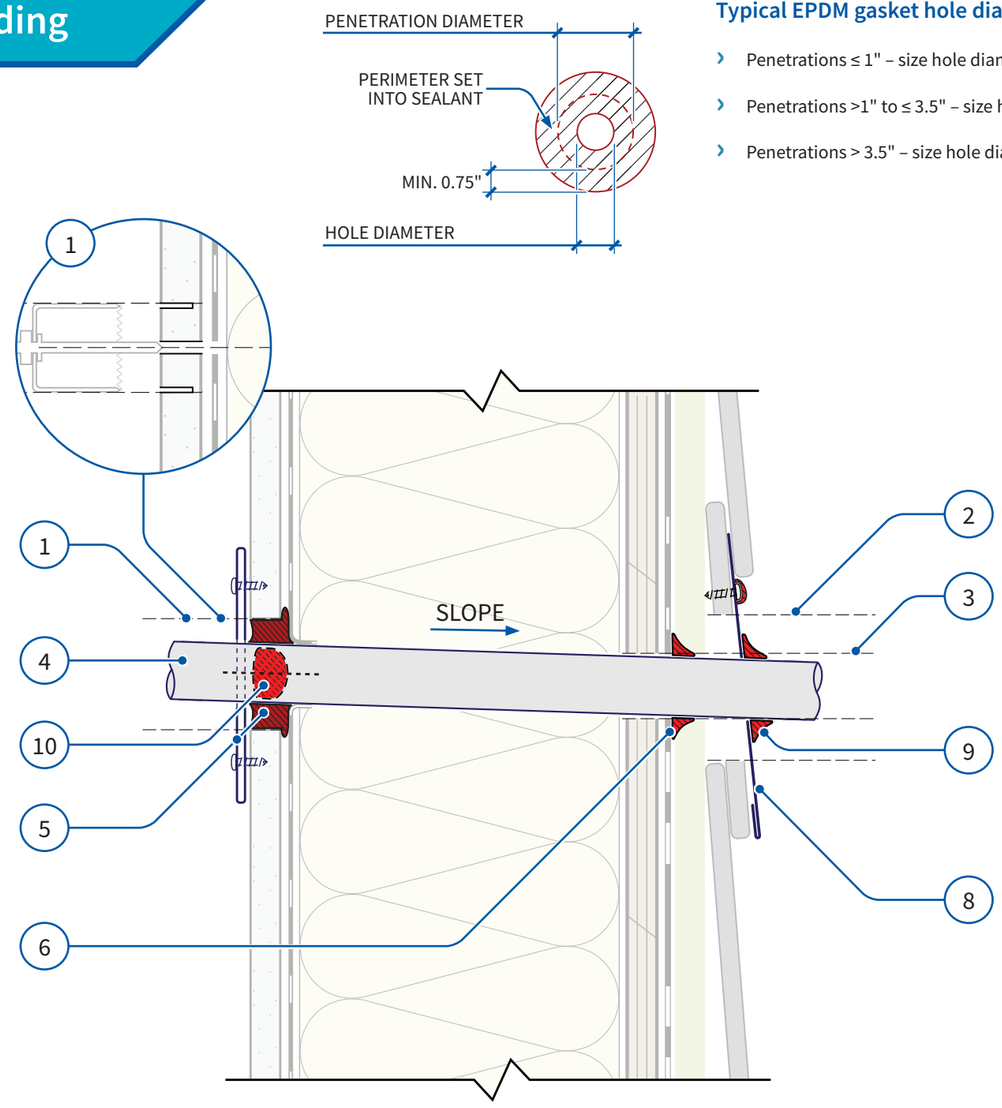
D-3A | Conduit/Pipe Through Rainscreen Cladding

Materials (for 1" Conduit/Pipe)

- Construction sealant for low surface energy materials
- Putty sealant, firestopping accessories
- Interior cover plate, exterior cover flashing
- Optional: unreinforced 60 mil EPDM gasket membrane

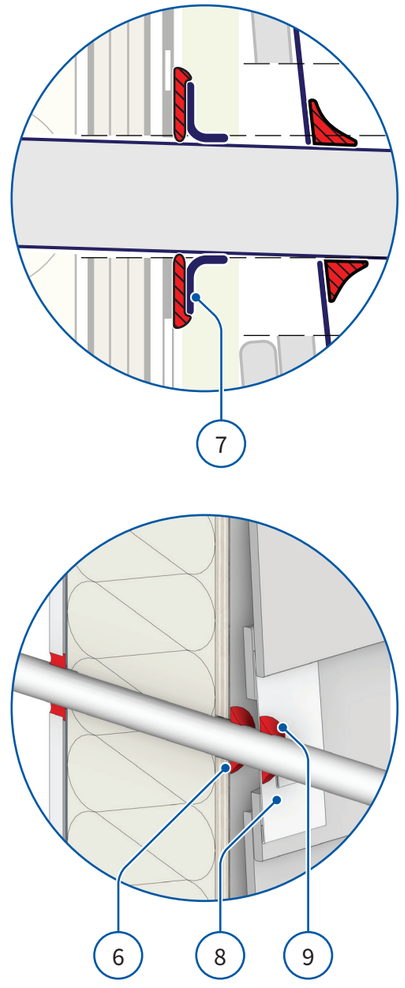
Steps (refer to Detailing Considerations on page 2)

1. 2" hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut. Pilot hole to the exterior with a 2% downward slope.
2. For the exterior penetration, 2.5" hole saw opening in the cladding, avoiding damage to sheathing membrane where possible.
3. Hole matching the diameter of the conduit/pipe drilled through the sheathing membrane and sheathing (after the 2.5" hole in the cladding).
4. Conduit/pipe inserted through the holes and restrained with fasteners or putty sealant as needed, with its final position centred in the openings.
5. Sealant (firestopping if necessary) tooled around the interior of the conduit/pipe, using the exposed poly as backer to fully fill the opening in the interior finish. Interior cover plate installed around the conduit/pipe as needed.
6. Sealant around the conduit/pipe at the exterior sheathing membrane.
7. Optional conduit/pipe penetration sealing approach using EPDM: Circular EPDM membrane with an under-sized hole fit around the conduit/pipe and carefully set into a continuous bead of sealant on the sheathing membrane around the hole.
8. Exterior cover flashing around the conduit/pipe, slipped behind lap siding where possible and set into sealant at the top and sides (see also D-3B).
9. Sealant tooled around the conduit/pipe at the exterior cover flashing.
10. Putty sealant within the conduit around wires where present.



Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" – size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" – size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" – size hole diameter @ 1.5" smaller than the penetration diameter



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D-3B | Conduit/Pipe Through Non-Rainscreen Cladding

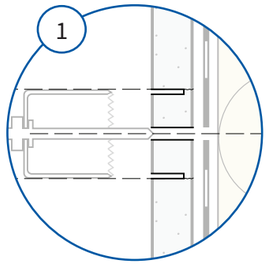
VERSION 1.1 | FEBRUARY 2025

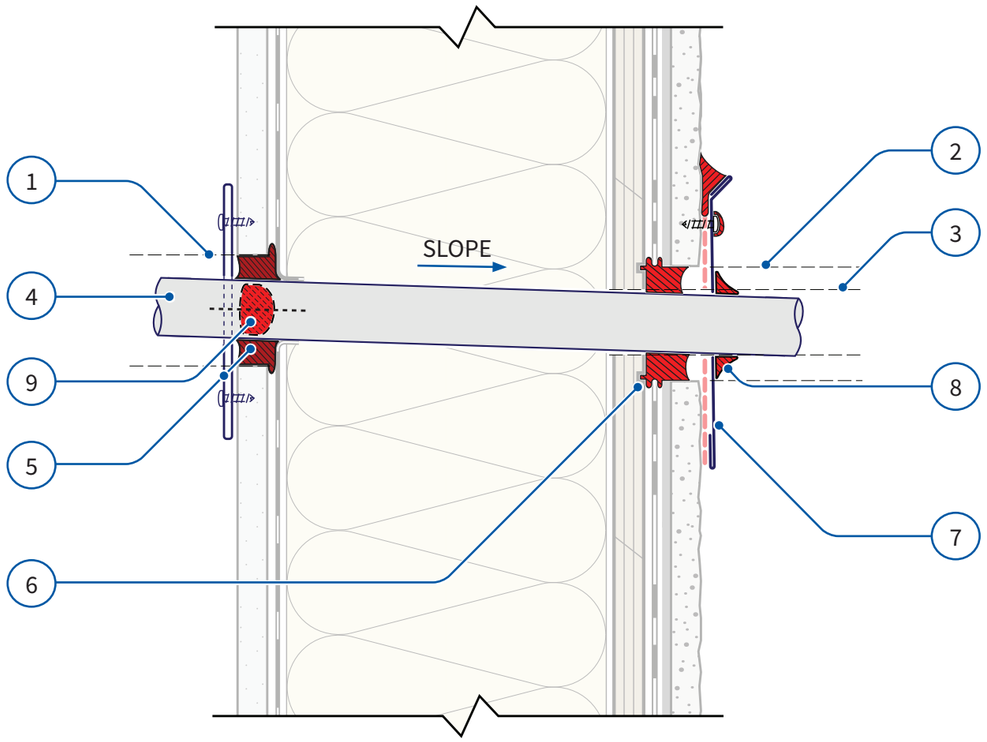
Materials (for 1" Conduit/Pipe)

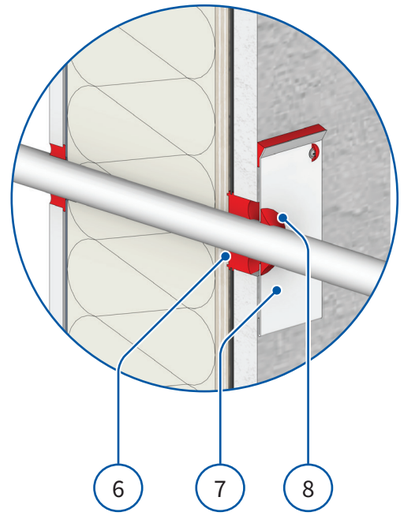
- Construction sealant for low surface energy materials
- Putty sealant, firestopping accessories
- Interior cover plate, exterior cover flashing

Steps (refer to Detailing Considerations on page 2)

1. 2" hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut. Pilot hole to the exterior with a 2% downward slope.
2. For the exterior penetration, 2" hole saw opening in the cladding and membrane, with a 0.125" kerf cut into the sheathing.
3. Hole matching the diameter of the conduit/pipe drilled through the sheathing membrane and sheathing (after the 2” hole in the cladding).
4. Conduit/pipe inserted through the holes and restrained with fasteners or putty sealant as needed, with its final position centred in the openings.
5. Sealant (firestopping if necessary) tooled around the interior of the conduit/pipe, using the exposed poly as backer to fully fill the opening in the interior finish. Interior cover plate installed around the conduit/pipe as needed.
6. Sealant tooled around the wire onto the sheathing to fully fill the opening, including into the kerf and around the edge of the membrane and cladding where possible.
7. Exterior cover flashing around the conduit/pipe, set into sealant at the top and sides, and with a reglet profile and sealant tooled at the top edge.
8. Sealant tooled around the conduit/pipe at the exterior cover flashing.
9. Putty sealant within the conduit around wires where present.







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PENETRATION LOCATION:

NOTES:

D-3B

D-3C | Conduit/Pipe Through Rainscreen Cladding in High Exposure Conditions

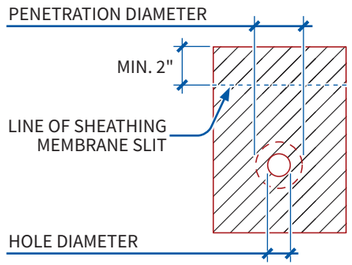
VERSION 1.1 | FEBRUARY 2025

Materials

- Electrical wiring, disconnect box, snap-in cable connector
- Construction sealant for low surface energy materials
- High-performance detailing tape, unreinforced 60 mil EPDM gasket membrane
- Putty sealant, firestopping accessories, trim board, flashing

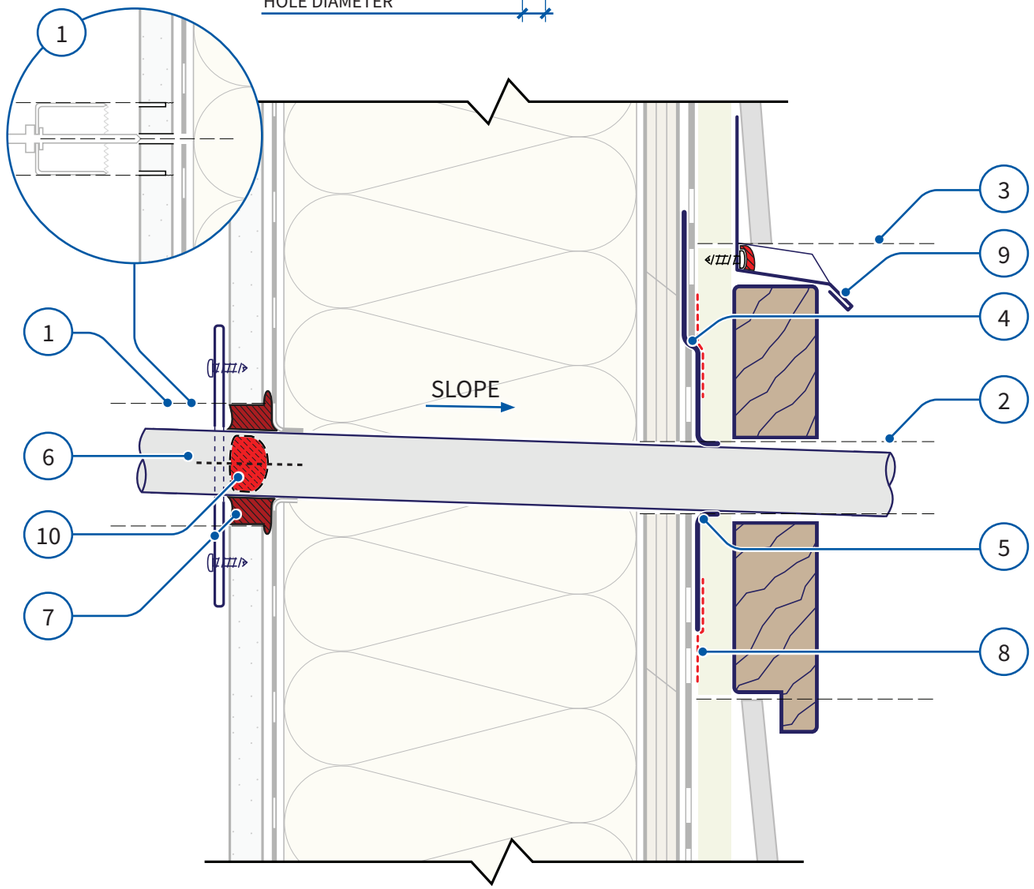
Steps (refer to Detailing Considerations on page 2)

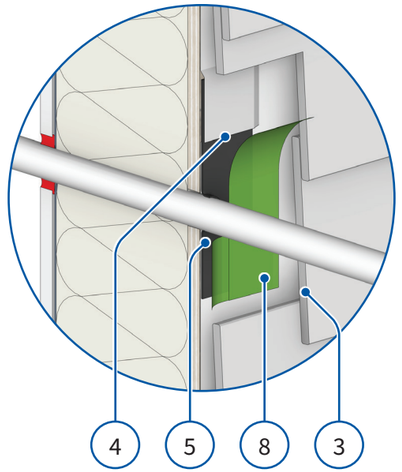
1. 2” hole saw opening in the inner interior finish, held back to avoid damage to the interior poly. Hole saw bit pried back and forth to release the hole offcut. Pilot hole to the exterior with a 2% downward slope.
2. Hole matching the diameter of the conduit/pipe drilled through the cladding, sheathing membrane, and sheathing.
3. Rectangular opening in the cladding with at least 3" clearance around the hole and large enough to receive the backing trim board and flashing (see Step 7), avoiding damage to the sheathing membrane and removing furring strips as needed.
4. Horizontal slit cut through the sheathing membrane to the width of the EDPM patch and located above the hole to allow lapping and taping of the EPDM patch (see Step 5).
5. EPDM membrane with an under-sized hole fit over the conduit/pipe at the exterior and with its top edge slipped behind the sheathing membrane in the slit from Step 4 (see sizing guide at top right).
6. Conduit/pipe inserted through the holes and restrained with fasteners or putty sealant as needed, with its final position centred in the openings.
7. Sealant (firestopping if necessary) tooled around the interior of the conduit/pipe, using the exposed poly as backer to fully fill the opening in the interior finish. Interior cover plate installed around the conduit/pipe as needed.
8. All edges of the EPDM patch taped onto the sheathing membrane with high-performance detailing tape.
9. Flashing and trim board fastened in place on furring as needed. Sealant at the sides of the trim board.
10. Putty sealant within the conduit around wires where present.

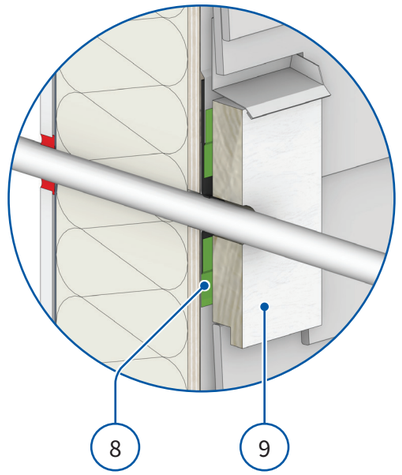


Typical EPDM gasket hole diameter sizing guide

- Penetrations ≤ 1" – size hole diameter @ approximately 40% of the penetration diameter
- Penetrations >1" to ≤ 3.5" – size hole diameter @ approximately 60% of the penetration diameter
- Penetrations > 3.5" – size hole diameter @ 1.5" smaller than the penetration diameter







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ADDRESS:

DATE:

DRAWING NUMBER:

PENETRATION LOCATION:

NOTES:

Detailing Guide for Heat Pump Penetrations in Existing Buildings

VERSION 1.1 | FEBRUARY 2025

END OF DOCUMENT

BC HOUSING
RESEARCH CENTRE

1701 - 4555 Kingsway
Burnaby, BC V5H 4V8
Phone: 604.439.4135
Toll-free: 1.866.465.6873
Email: research@bchousing.org
www.bchousing.org