



# PRODUCT MANUAL

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Version 1.1

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Quad-Lock Building Systems Ltd. was established in 1994 in Surrey, British Columbia, Canada. Quad-Lock develops, manufactures and distributes patented Insulating Concrete Form (ICF) systems for walls, floors and roofs. In addition to its ICF product lines, Quad-Lock has launched the R-ETRO System. The R-ETRO System is a patent pending solution for adding interior and exterior insulation to existing buildings.

For assistance with this manual or any of our product lines, please contact the regional sales manager serving your area or contact our head office:

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Warning – Quad-Lock metal parts are galvanized to minimize corrosion, however, please be aware that:

- Metal connectors, anchors, fasteners, and other metal components will corrode and lose load carrying capacity, if installed in corrosive environments.
- Many new types of treated wood are highly corrosive to metal components, especially lumber treated with ACQ (alkaline copper quaternary).
- Quad-Lock recommends that metal components should NOT be used in contact with treated lumber in exterior applications or anywhere water is likely to be present (unless you ensure compatibility of your treated lumber with the metal components).
- For exterior applications, the project engineer should specify the type, size and spacing of corrosion resistant bolts, concrete anchors, and other metal fasteners.

**LIMITED PRODUCT WARRANTY**

Quad-Lock Building Systems, Ltd. ("Quad-Lock") warrants that its products are free from manufacturing defects affecting the products' intended use ("Defects"). If the customer believes that the products have Defects, the customer will return samples of the defective products to Quad-Lock and upon Quad-Lock being satisfied that the products have Defects, Quad-Lock will replace the defective products or refund the purchase price, at Quad-Lock's option. No other warranty is applicable or will be implied. The customer hereby irrevocably waives any and all rights with respect to any implied terms or warranties under the provisions of the Sale of Goods Act or under any law or legislation of similar effect whether now or hereafter in effect. The customer acknowledges and agrees that except as provided herein, there are no conditions, warranties or guarantees whatsoever, express or implied, that the products are of a particular quality or condition, durability or fit for any particular purpose.

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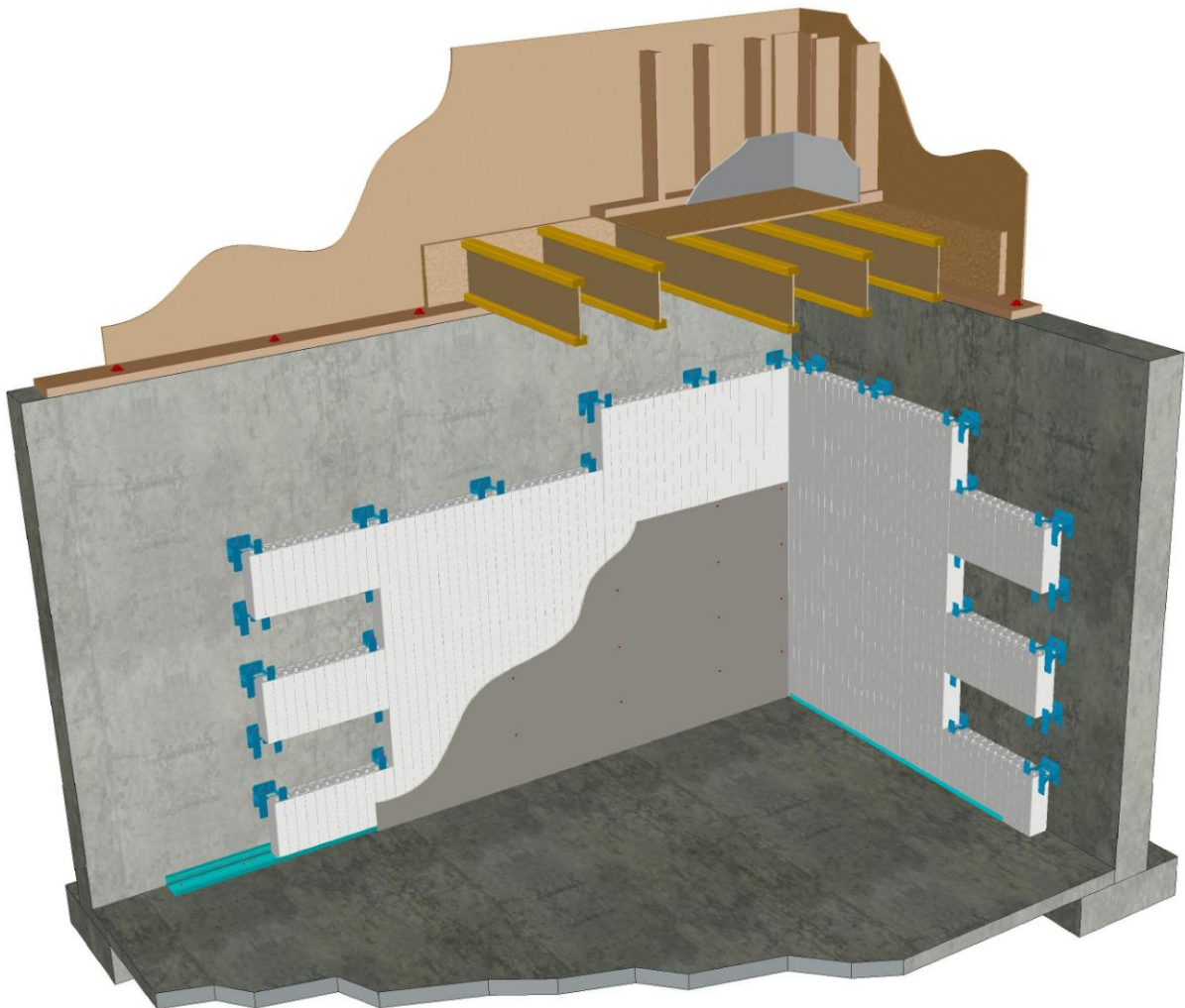
# 1 INTRODUCTION

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## R-ETRO SYSTEM OVERVIEW

As energy costs continue to rise, owners are considering the benefits of adding insulation to their buildings as a way to comply with new code regulations or simply to lower their heating and/or cooling costs. When done in conjunction with other scheduled maintenance or rehabilitation, insulation is a cost-effective way to improve the building envelope performance in terms of conductive heat loss or gain and air infiltration or exfiltration. In the case of un-insulated basements, the addition of interior insulation makes basement space more useable and comfortable.

The R-ETRO System offers building owners a simple yet effective way to attach the market's best price/performance insulation products (R-18 expanded polystyrene) to an existing building and then serves as a fastening point for finish materials. Whether in a hot climate or cold, dry climate or wet, the R-ETRO System is great value for the money.



*Figure 1: Interior Application*

### Benefits of the R-ETRO Systems:

- Reduced heat loss or gain via conduction through wall materials
- Dramatically reduced levels of air infiltration and/or exfiltration
- Improved occupant comfort and health
- Substantial energy savings
- Reduced maintenance costs
- Prevention of corrosion of metal components in the wall
- Increased durability of the wall
- Reduction in potential for mold growth
- Small incremental cost of adding insulation

### How It Works:

R-ETRO Plus Ties are fastened to the existing building with screws at maximum 24" [610mm] centers. R-18 Plus Panels are fit over the tie flanges and another row of R-ETRO Plus Ties are placed again in the tops of the panels at 24" [610mm]. Screws are driven through the base plates of the second row ties, similar to the first row. Another row of panels is placed, offset by 24" [610mm] from the row below and the same procedure is repeated to the top of the wall.

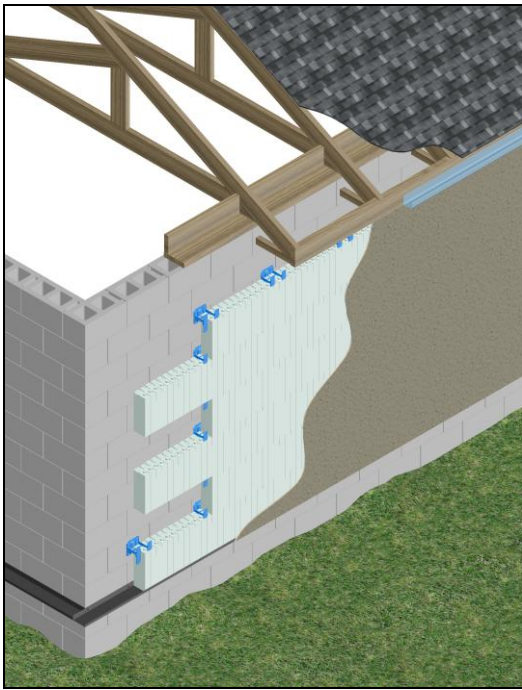


Figure 2: Exterior Application

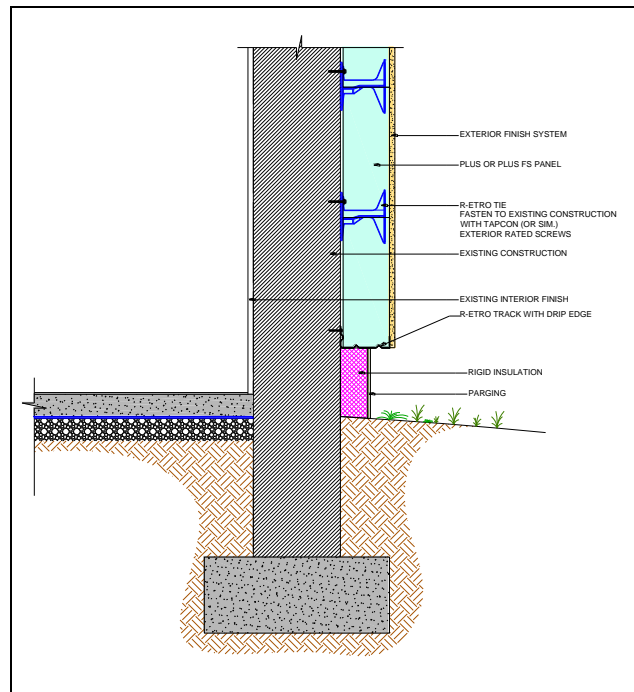


Figure 3: Exterior Application Detail

Panels can be easily cut around openings and protrusions from the building. A drywall saw works best.

Finish material can be applied directly to the R-ETRO System (acrylic stucco, cementitious stucco, sheet exterior finish products). Choose Plus FS (fastening strip) Panels to support lapped siding or shingles.



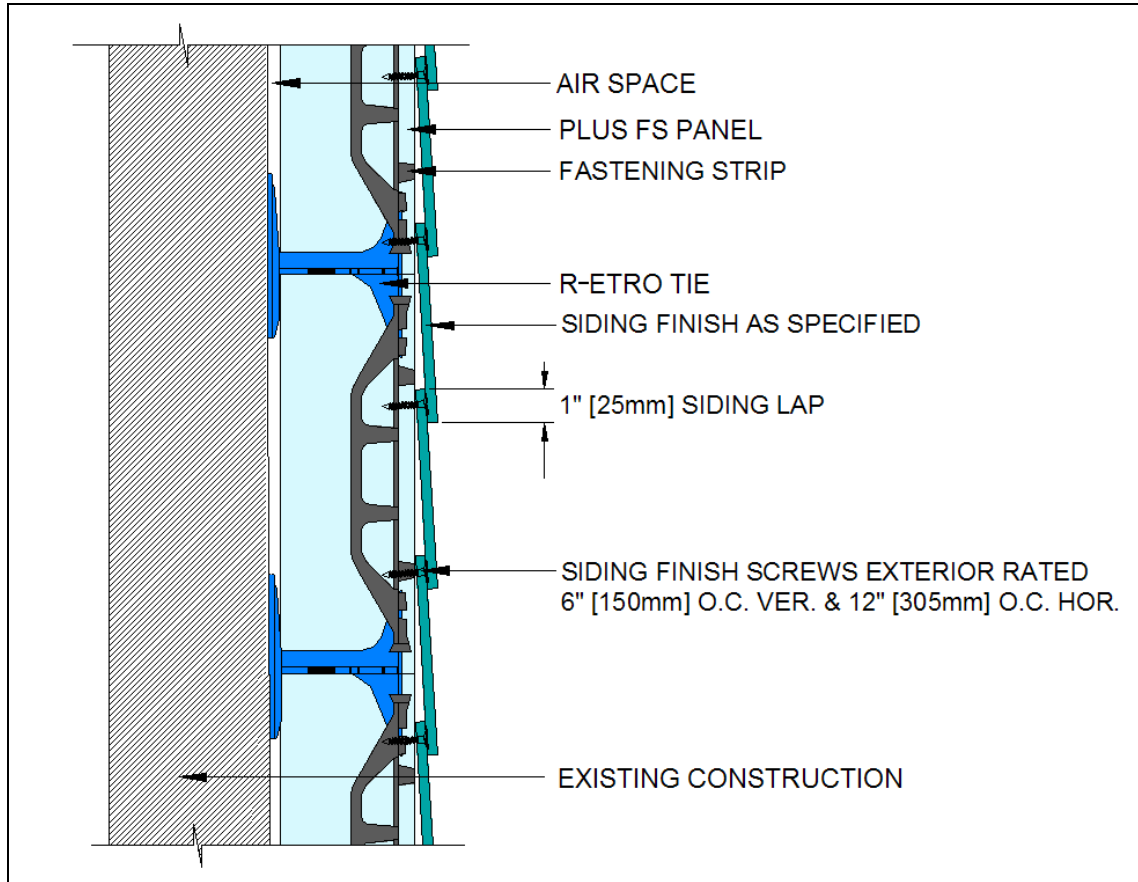


Figure 4: Lapped Siding Detail using Plus FS Panel

## GENERAL CONSIDERATIONS

1. The services of a licensed engineer should be employed to determine the suitability of substrates and fasteners in view of expected loads.
2. Repairs must be made to damaged substrate surfaces before installation of insulation.
3. Proper details should be developed for balconies, roof canopies, windows, doors, and service penetrations.
4. Specifications and proper contract and permitting documents should be prepared for any major wall rehabilitation.
5. For exterior applications, an air barrier should be installed over the surface of the building prior to application of the insulation system to ensure air tightness of the envelope.
6. Plus Panels are generally rated for use in "combustible" (USA Type V – Canada NBC 2005, Div B, Part 3) construction. Plus Panels must be covered with rated fire-resistive finishes in "non-combustible" (USA Types I and II – Canada NBC 2005, Div B, Part 3) applications.
7. The most cost-effective way to install the R-ETRO System is during a planned rehabilitation of the building exterior, or to finish a previously unfinished interior space.
8. Payback can be affected by the cost quotation from the installer and space heating costs. In most cases, insulating walls with no existing insulation will provide a faster payback.
9. Walls with existing insulation will have longer payback periods, but their durability will increase significantly with proper installation of new insulation and siding.
10. In all cases, the R-ETRO System should be installed within the guidelines of applicable building and electrical codes.
11. Where air leakage is a concern, visible gaps in foam should be sealed with minimal expansion spray foam.

## **R-ETRO SYSTEM & MOISTURE CONTROL**

Control of moisture is one of the most important issues in building design. Moisture stored within a building envelope can promote undesirable effects like mold and decay if there is sufficient moisture present and the building components are susceptible to water damage. The R-ETRO System can be a key component in the strategy to control moisture in an existing building.

### **Cladding:**

The primary defense against wind-driven rain on a building is the exterior cladding. The cladding may be a trowel coating, a panel product, or lapped siding and may be made from cementitious materials, plastic, wood, or fiber cement. Any of these products, when properly applied, serve as an effective barrier against wind-driven moisture intrusion. The R-ETRO System is specifically designed to accept any of these common exterior treatments. Ties are intentionally recessed below the foam surface to allow the application of coatings like stucco and acrylic finish systems. Tie flanges can be used as points of attachment for screws driven through panel products like fiber cement sheet siding. Fastening Strip panels are available for instances where lapped siding requires a continuous fastening pattern of 6 inches or less.

### **Water Resistant Layer:**

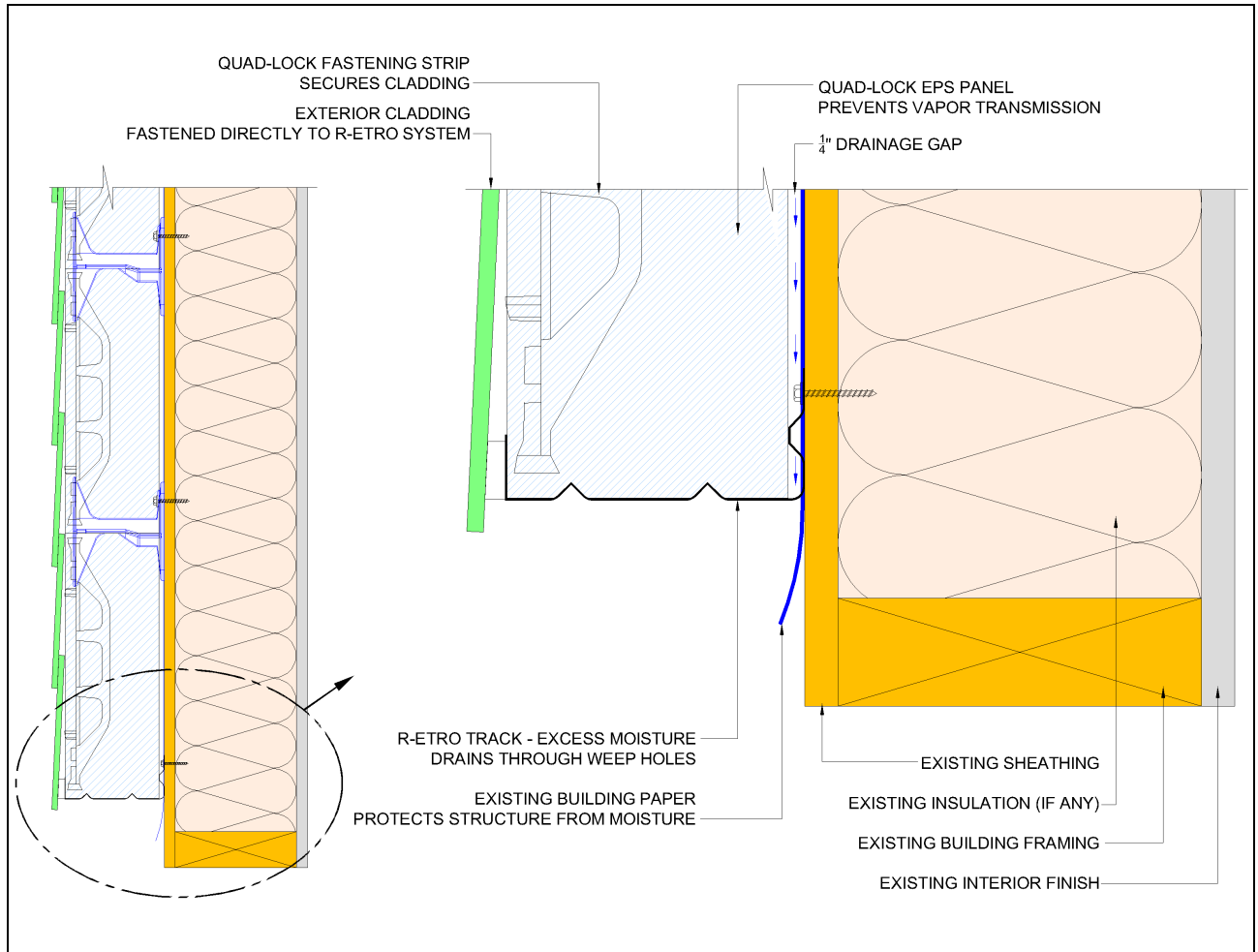
In addition to supporting the exterior cladding barrier, the R-ETRO System itself serves to resist moisture. The expanded polystyrene (EPS) that makes up the Plus panels has very little ability to absorb, transmit, and store water. In fact, the permeability of closed-cell EPS is so low that it can be considered a vapor barrier like polyethylene sheeting or some barrier rated paints. Consequently, even if water gets past the exterior cladding, the R-ETRO System EPS will not absorb any significant amount of water. Additionally, Plus Panels have been proven to be a completely unsustainable environment for mold or mildew, offering no organic food source and insufficient water to promote growth.

### **Drainage Layer:**

Another common strategy used by building envelope designers is a concealed drainage layer. This is a small (even fractions of an inch) gap located inside the cladding through which water may gravity-feed to the bottom of the structure and be drained away. This is a very common feature of buildings with brick or other masonry facades. The R-ETRO Ties by their design hold the Plus Panels  $\frac{1}{4}$ " [4mm] away from the supporting surface and form a perfect drainage layer. Any accumulated water escapes the R-ETRO Track at the bottom of the structure through weep holes in the track. Water from the face of the building is directed away by a built-in drip-ledge featured in the R-ETRO Track. In the case of existing wood structures, building codes require installation of building paper prior to installing the R-ETRO System. This impermeable layer insures that water does not come into contact with wood, even if moving downward through the  $\frac{1}{4}$ " [4mm] drainage cavity.

### **Vapor:**

Existing buildings, especially those designed many years ago, are often prone to allow air and water vapor through inherently leaky walls. This is particularly true of wood framed structures. During renovation of such structures, a vapor barrier should be installed on the appropriate side of the building to minimize potential 'vapor drive' through walls. Airborne water vapor can then be removed through a properly sized ventilation system. However, if vapor drive should occur, the R-ETRO System installed on the outside of the existing building moves the point where condensation can happen (called "dew point") outside of the existing structure to inside the Plus Panel, which is well past the other layers that drain or diffuse moisture.



*Figure 5: Vapor Moisture Detail*

The R-ETRO System offers more drying and drainage capacity than the amount of water to ever likely be present, either from wind-driven rain infiltration or pressure-driven vapor. In all cases, obvious gaps between or around Plus Panels should be sealed with spray foam to insure the integrity of the system.

### TOOLS:



Tape measure



Laser Level



Chalk Line



Small Roto-Hammer



Cordless Drill



Masonry Bits



Drywall Saw



Circular Saw



Extendable Razor Knife



Felt Pen



Spray Foam (min. expansion)

### OFF-THE-SHELF COMPONENTS:

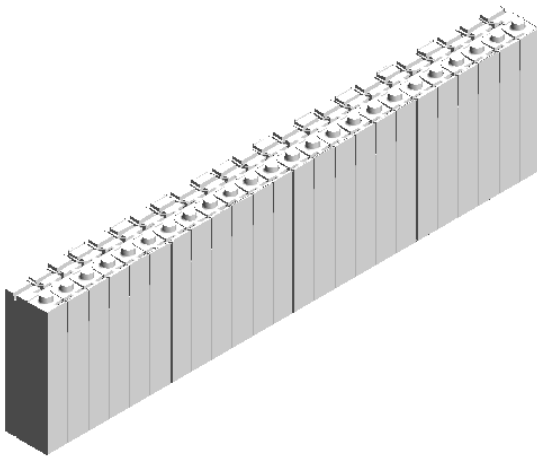


2"x2" Galvanized Flashing

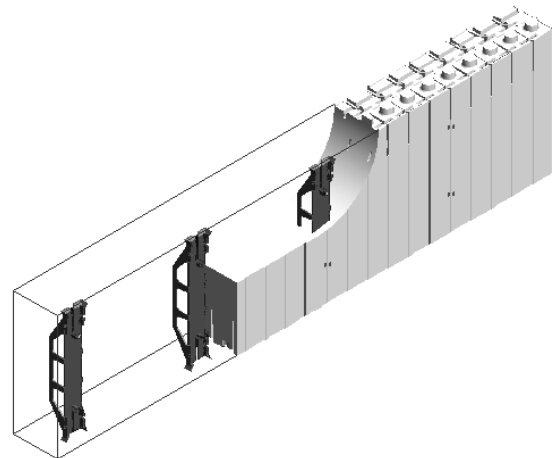


Concrete/Masonry/Wood (Grabber) Screws

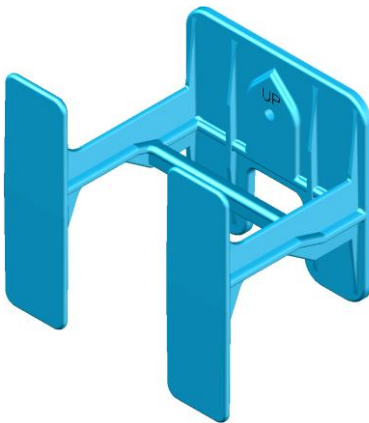
## R-ETRO SYSTEM COMPONENTS & ACCESSORIES:



**Plus Panel**  
Part#: QXP2 Plus



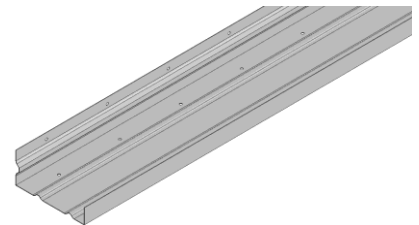
**Plus FS Panel**  
Part #: QPX2 Plus FS



**R-ETRO Plus Tie**  
Part#: RT PLUS



**R-ETRO Plus Top Tie**  
Part#: RTT PLUS



**R-ETRO Plus Metal Track**  
Part #: CTP R-ETRO PLUS



**Wind-lock Fasteners – Stucco**  
Part #:WIND1



**Wind-lock Fasteners – Regular**  
Part #: WIND2



**Track Fastener**  
Part #: ZAM14114

### ESTIMATING GUIDE:

**1. Obtain the following information from the plans and specifications:**

Length of walls to be insulated (lineal feet or meters)

Height of walls to be insulated (lineal feet or meters)

Measure the size of door, window, and other openings; Determine total area of openings (sq. ft. or sq. meters).

**2. Using the information determined in #1:**

Calculate the total square footage of the wall, i.e.

Length x Height = Total wall area

Subtract window and door area to determine net wall area to be insulated (sq. ft. or sq. meters).

**3. Panel Pairs required:**

Calculate the required number of panels by dividing the net square area (sq. ft. or sq. meters) of insulation area by: 8 sq. ft per panel pair, or .74 sq. meters per panel pair.

**Note:** All panels are sold in pairs.

**4. Plus Ties required:**

Your job will require either 2 or 4 ties per panel, depending on load applied (see Fastening Requirements table).

To cross check: Divide net square area of insulation, either by 2 or 1 to arrive at total ties required.

**Important:** Add extra ties for each opening and each corner for every level of panels.

**5. Plus Top Ties required:**

Total lineal footage divided by 2 (or 1 depending on wind-loading - see Fastening Requirement section for more details) .

**6. R-ETRO Track required:**

Total lineal footage x 1.

**7. Track Fasteners required:**

Total lineal footage divided by 2.

**8. Wind-locks required:**

Box of 1000.

## 2 DESIGN & CONSTRUCTION DETAILS

### PREPARATION

Before you start, all existing walls must be inspected for structural soundness. The R-ETRO System should be applied only to substrates (or supporting structures) that are able to support the imposed loads of insulation, finish materials. For exterior applications, wind loads also need to be considered. The services of a structural engineer may be necessary to determine suitable specifications.

Be sure to check the applicable building code in your area regarding insulation, framing and vapor barrier requirements.



Figure 6: Structural Inspection

### FASTENERS

If attaching to a concrete or masonry wall, use a masonry screw (TapCon or equivalent) to pre-drill and fasten the R-ETRO Plus Track and later the R-ETRO Plus Ties to the wall. If attaching to wood studs, it's best to use a decking screw and fasten track and ties only to solid wood members where a minimum 1" [25mm] penetration is available. To fasten to plywood sheathing materials or existing cladding, spreader anchors should be used. In wood or metal stud applications, shift the panels and ties to align with the stud layout. For all exterior applications, fasteners that carry an exterior rating should be used.

### LAY OUT

A level reference line should be struck on the wall  $1\frac{3}{4}$ " [45mm] above the **highest point** in the floor or exterior grade. This line will serve to locate a row of R-ETRO Plus Metal Track which will serve as a tray to support the first row panels. Because the floor or exterior grade may not be level, use a laser device or spirit level to determine the highest point before striking a line. Most jurisdictions require a space of approximately 6" [152mm] between finish grade and finish exterior building cladding. Steps in the installation may be necessary if exterior finish grade falls away from the building. Make these steps in 12" [305mm] increments to match panel height. If fastening to wood furring or studs behind drywall, clearly mark their locations from floor to ceiling.

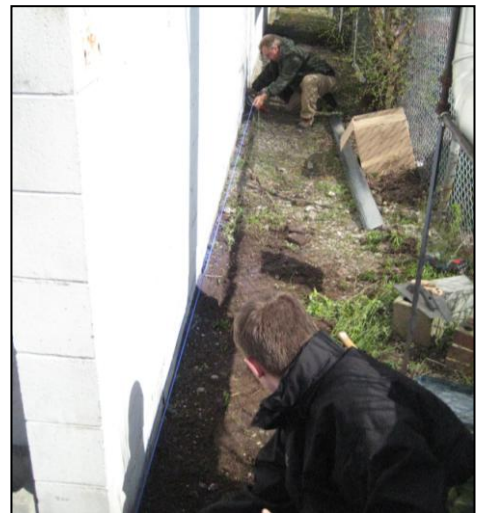


Figure 7: Strike a Reference Line



### FASTENING R-ETRO PLUS TRACK

Turn the R-ETRO Plus Track so the taller of the two flanges is against the wall. Fasten the R-ETRO Plus Track at 24" [610mm] centers (for concrete walls) or on the existing wood stud layout with exterior rated screws, aligning the top of the flange with the level reference line. For concrete walls, you will have to pre-drill the concrete with a properly sized masonry bit to accommodate a concrete screw (TapCon or equivalent). The attached R-ETRO Plus Track now serves as a tray to hold the first row of Plus Panels and a barrier to insects.

**NOTE:** It is easier to start using the R-ETRO System with a level surface. If you simply fasten the track to an out-of-level floor, you will have to scribe each panel at the top which will create more work.



Figure 8: Fastening R-ETRO Plus Track

### TIE PLACEMENT

Insert the first row of Plus Panels into the R-ETRO Plus Track with interlock knobs facing up, making sure that they are pushed all the way into the track. Insert the R-ETRO Plus Ties into the top panel slots at maximum 24" [610mm] intervals, and as near to each end as possible. Always bridge two panels with one tie (see Figure on Page 17).

**NOTE:** Higher wind loading conditions may require more ties and/or more frequent fastening. Consult the load tables contained in Appendix C.

Fasten ties to the wall with the appropriate screws, as described above. For wood or metal stud walls, shift the ties and/or the panels to align ties with the studs. If studs are out of alignment, you may have to attach a piece of blocking between two studs to provide a fastening point for that tie. Ties should be at regular intervals if possible (i.e., 12" or 24" [305mm or 610mm]). Use a felt pen to mark irregular spacing of ties for later reference during cladding application.



Figure 9: Place Plus Panel in R-ETRO Track



Figure 10: Place R-ETRO Plus Tie in Plus Panel



Figure 11: Fasten Ties to Wall



## SECOND AND SUCCEEDING ROWS

Fit the Plus Panels over the first row of ties with interlock knobs facing up. Start with a 12" or 24" [406mm or 610mm] offset from the ends of the first row panels below so the joints don't line up. Make sure that joints fall in the middle of a pair of tie flanges. Add extra ties if necessary, but try to stay on a regular layout. Cover the entire wall area in a similar fashion, staggering each succeeding row from the previous one.

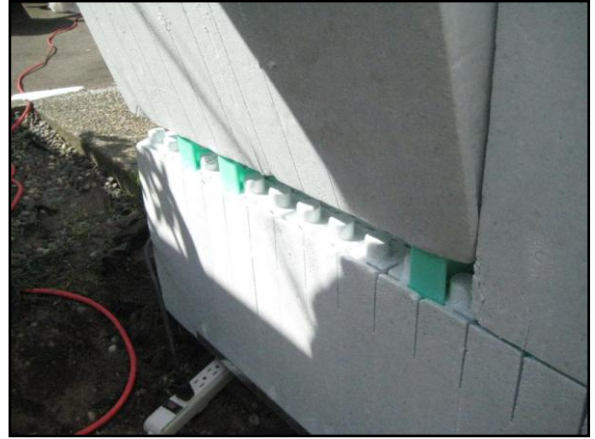


Figure 12: Stagger Second Course with Ties at Joints

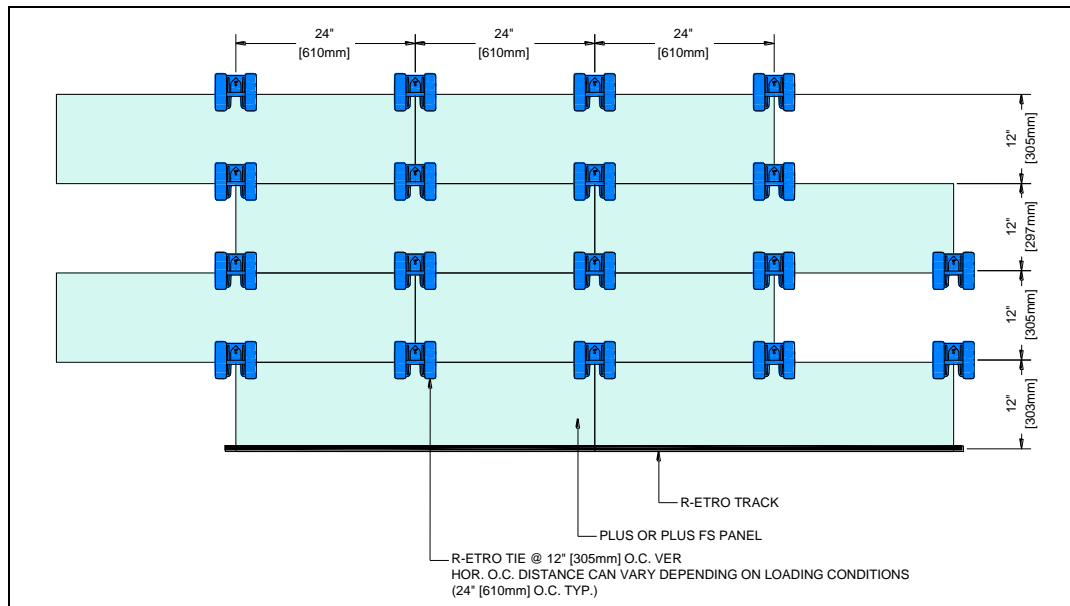


Figure 13: Succeeding Row Placement

**Note:** Conserve material by cutting any panel scrap generated to increments matching ties or by placing a tie at each joint as the smaller pieces are used throughout the installation.

## CORNERS

At 90 degree corners, Plus Panels can be lapped over one another and do not need to be mitered. It is important to place a R-ETRO Plus Tie as close to the corner as possible on both sides to provide secure fastening of panels to the building, and to provide an anchorage point for siding or trim.

In the case of a non-90 degree angle, Plus Panels should be mitered and fit together and any gap filled with spray foam. A flexible corner bead should be used to support finish materials.

Wood or metal trim pieces may be fastened together in an 'L' fashion and screwed to the R-ETRO Plus Ties on one side of the corner and fastened with adhesive on the other if the first available tie flange is not covered by the trim board.

### WINDOWS AND OTHER OPENINGS

As the courses reach the level of windows (or penetrations of the building by utilities), the panels must be cut to fit around such elements.

**Note:** Place ties close to edges of these modifications on all sides to provide attachment points for finish materials installed later. Use a drywall saw or hot-knife tool to fashion custom-shaped cuts. If the Plus Panels must be cut to fit, fill any remaining gaps with spray-foam insulation to complete the insulation layer and avoid thermal breaks.

#### Window Details

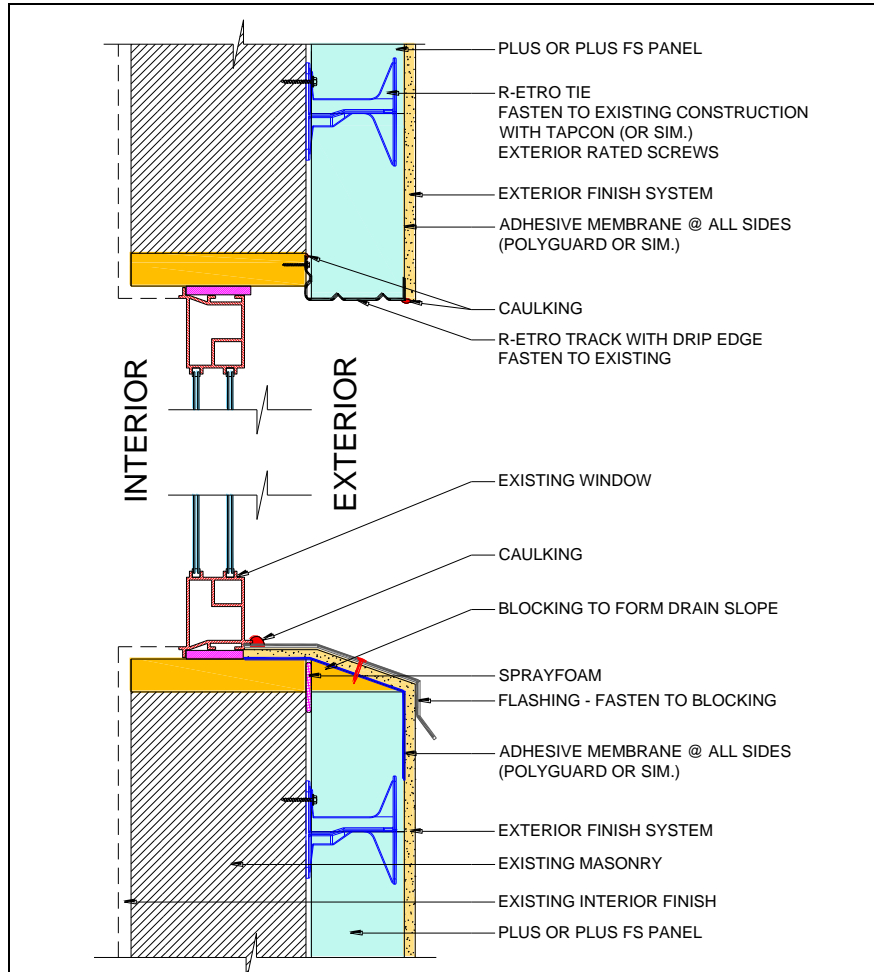


Figure 14: Section at Head Details

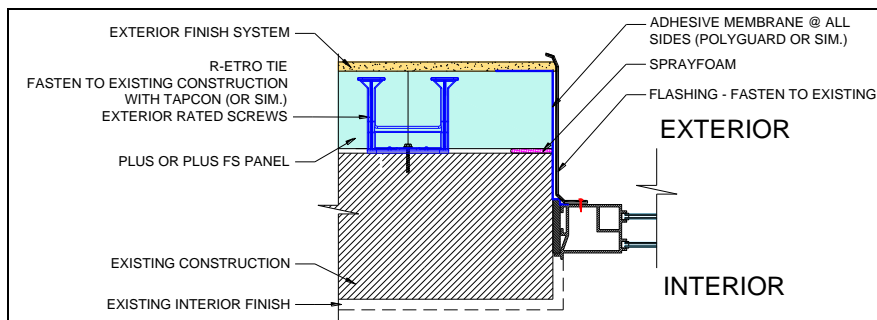


Figure 15: Section at Jamb Details

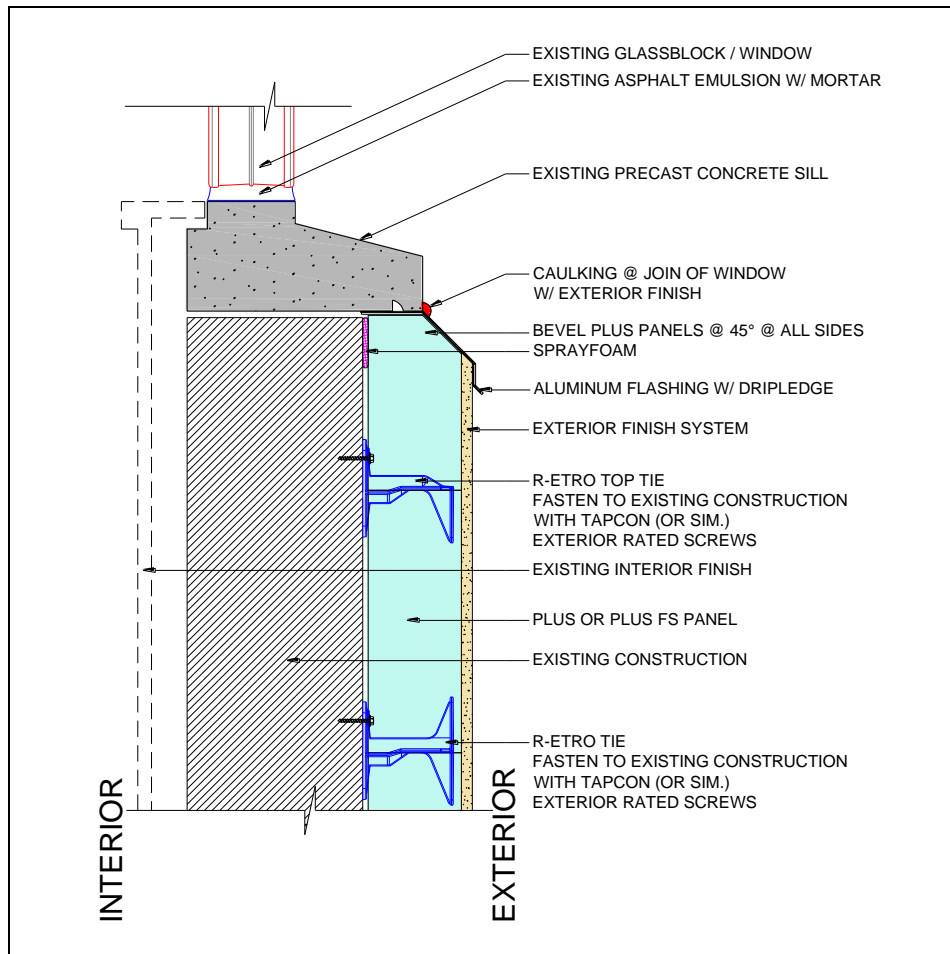


Figure 16: Section at Sill Details

### Interior Application – Windows

Gypsum drywall can be wrapped around the interior of the opening and held in place with foam adhesive. Butt edges of drywall to window frame and seal with caulking. Alternatively, the old window sill can be removed and replaced with a wider (+4½" [114mm]) wood sill.

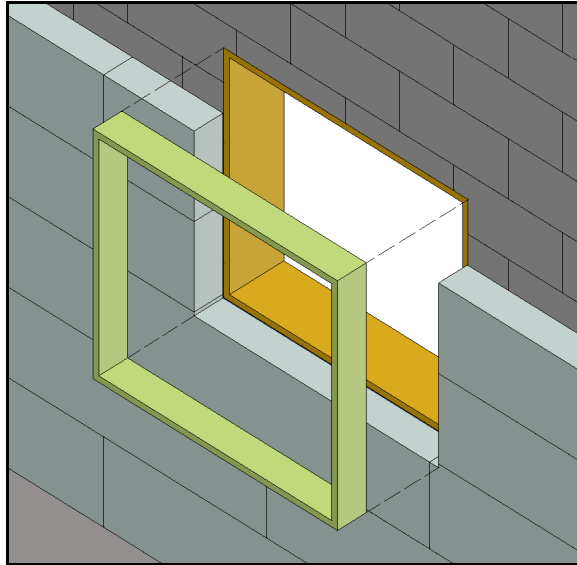


Figure 17: Jamb Extension

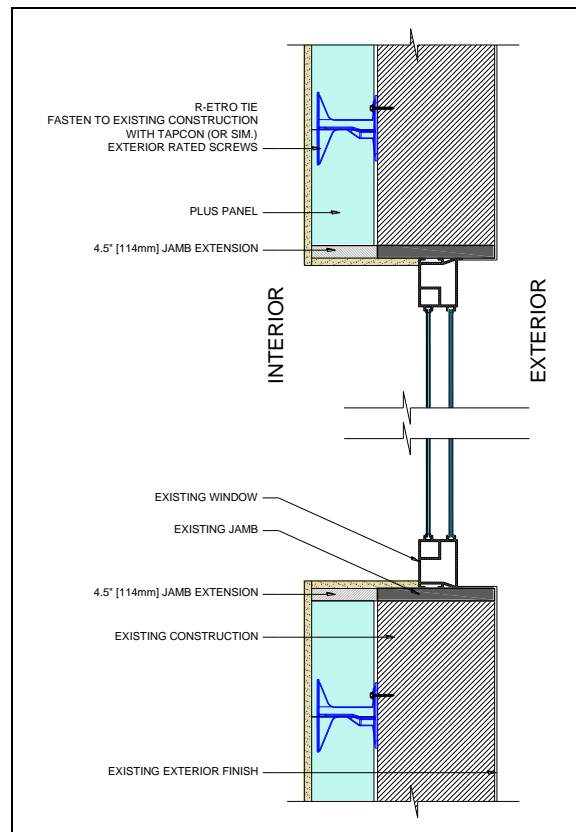


Figure 18: 4.5" [114mm] Jamb Extension Detail

## Exterior Application – Windows

See the section on Interior & Exterior Finishes (on page 25) for particular finishing methods.

Window openings should be flashed and sealed during a R-ETRO System installation as if they were a new building installation and in compliance with current codes.

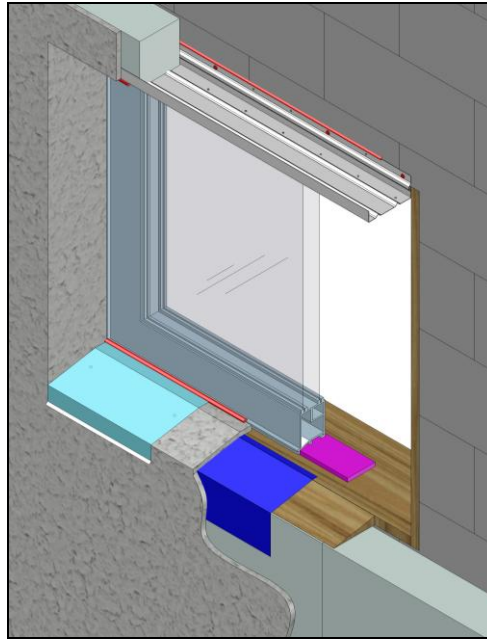


Figure 19: Exterior Window Application

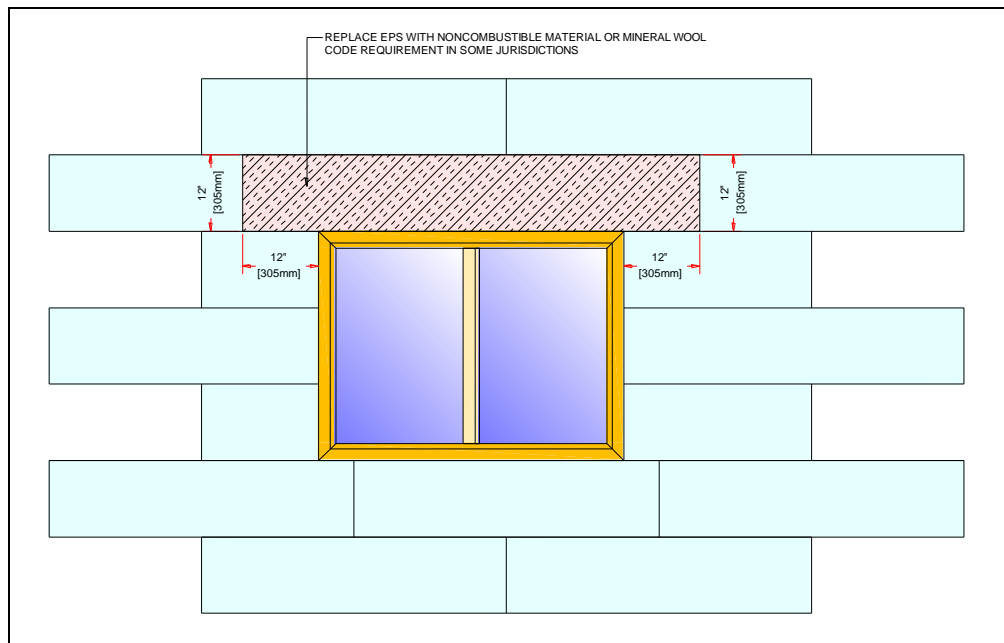


Figure 20: Window Opening Detail

**BUILDING TIP:** Fashion a tapered sill (no higher than the window frame) from a Plus Panel with a saw or hot-knife to promote drainage away from the window. Adhere tapered sill to the existing sill and window frame with spray foam; Coat with stucco or acrylic finish. Seal with caulking against window frame.

### Door Openings

Doors jambs may have to be uninstalled and have a 4½" [114mm] jamb extension added to bring door jambs flush to the foam surface. To center the door in the wall, add 2¼" [57mm] to each side of the jamb, and re-install the jamb. Do not nail or screw jambs directly to the R-ETRO System components. Fasten only to structural elements in the wall. Spray foam adhesive can be used to infill gaps and provide a bond between jamb material and panel material, if so desired. Use only "minimal expansion" foam in this application.

### TOP OF WALL

When the last full height row of panels is in place, remove the interlock knobs using a razor knife and place R-ETRO Plus Top Ties. Measure the remaining space between the last full panel and where the panels must terminate. Top row panels are then ripped lengthwise to match the desired elevation of the wall. Use spray foam adhesive against the back wall to adhere the top panel into place. Push top row panels into position and fill any remaining gap with spray foam to prevent air leakage.

If necessary, a metal 'L' flashing can be attached to the joists or soffit above to hold the top panel into place, and provide a solid fastening point for finishes. (See Figure 22.)



Figure 21: R-ETRO Plus Top Tie Installation

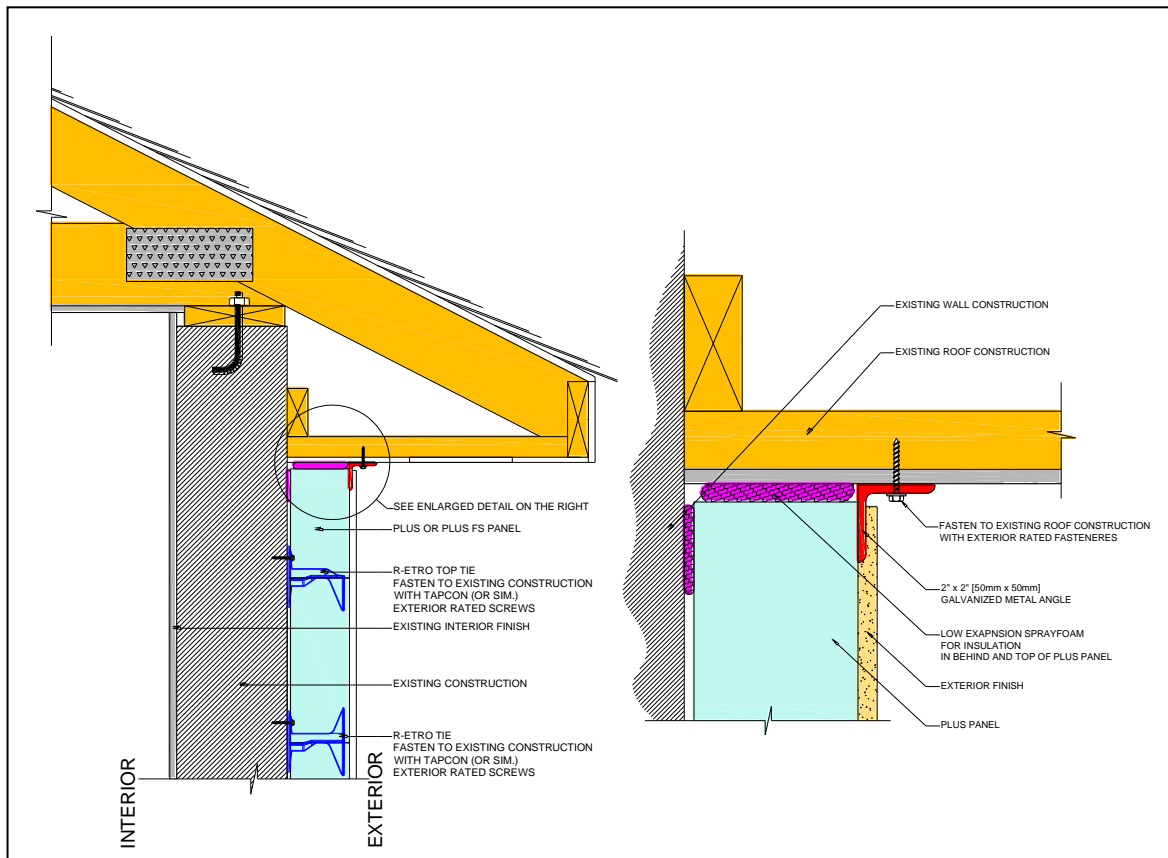


Figure 22: "L" Flashing Detail



## ELECTRICAL BOXES

Consult with a licensed electrician prior to commencing any work that may affect existing electrical installations. Doing your own wiring is dangerous. Renovations to electrical systems must be done in compliance with local, regional and national codes. (Refer to Appendix B for Electrical Code References.)

Boxes for switches and outlets should be extended to finish flush with gypsum drywall, siding, stucco or other finishes. Re-positioning of boxes may be necessary to allow for sufficient wire length. **It is NOT recommended leaving existing boxes in position below the surface of the R-ETRO System.** New boxes may be fastened to plywood shims which are first attached securely to the existing wall. Box extensions may be added to bring the box flush to finish materials. If conduit is fastened to existing walls, cut a channel with a hot knife or circular saw to accommodate the conduit. If conduit is not required, unsheathed cable may be embedded into the EPS foam panels and secured with spray foam. Chases may be cut with a hot knife or electric saw.

**NOTE:** The existing position of electrical boxes may not leave enough wire to extend into a new, repositioned box. Have a licensed electrician with remodeling experience make a proper extension and re-connection. Refer to Appendix B for Electrical Code References.

Make sure that new electrical fixtures (lights, signage, wall sconces, media equipment connections, etc.) have a wood or metal connection point directly fastened to the wall. Do not attempt to fasten fixtures directly to drywall, foam, ties or exterior cladding.



Figure 23: Electrical Box Extensions

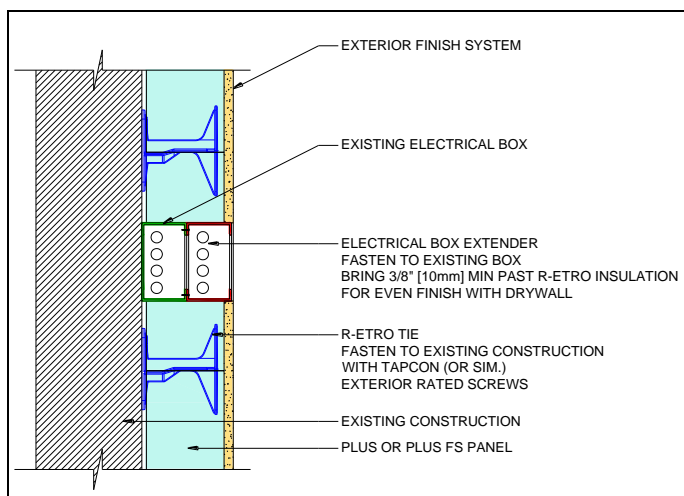


Figure 24: Electrical Box Extender Detail

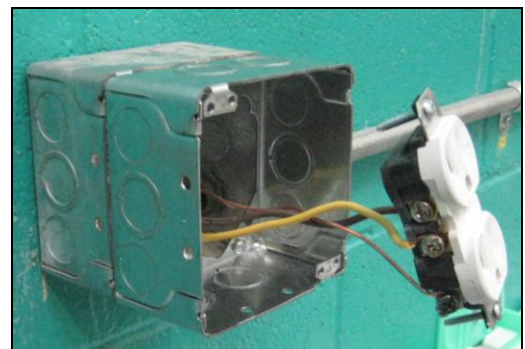


Figure 25: Attachment of Electrical Box Extension

### PLUMBING FIXTURES

Wherever possible, plumbing fixtures (laundry boxes, water outlets, guttering, drains, etc.) should be brought flush to the new surface of finish materials covering the R-ETRO System. This may entail re-routing supply and drain lines to terminate on a solid wood or metal substrate that is fastened securely to the existing wall. Use treated lumber, treated plywood or galvanized metal to fashion a backing plate to support plumbing fixtures. Attach to the wall with stainless steel fasteners to resist moisture.

Do not attempt to fasten fixtures directly to drywall, foam, ties or exterior cladding.

Supply or drain lines may be embedded into the EPS foam panels and secured with spray foam. Chases may be cut with a hot knife or electric saw. Check local codes for protection requirements.



Figure 26: Hose Bib Extension

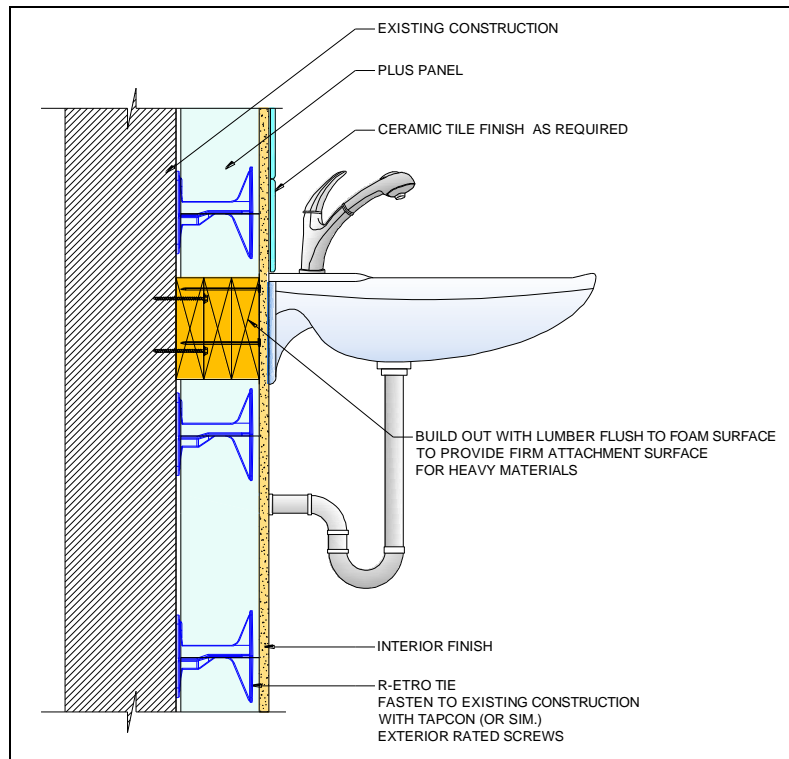


Figure 27: Plumbing Details



## **INTERIOR AND EXTERIOR FINISHES**

All common finishes can be attached to the R-ETRO System.

### **Fire Code**

For interior applications, the R-ETRO System is permitted for use in combustible construction if covered by a rated 15 minute thermal barrier and not be left exposed. The most common thermal barrier is ½" [12.7mm] gypsum drywall. Consult your building department for local regulations governing "foamed plastic insulation". (USA – IRC 314, IBC 2603, Canada – NBC Part 9, Section 9.10.17.10, NBC Part 3, Sections 3.1.4.2 & 3.1.5.12.) See Appendix B for more details.

For exterior applications, the R-ETRO System may be required by code to be covered by a rated thermal barrier, depending on the use and classification of the building. Check with the building department or code consultant to determine local fire code requirements. The application of exterior gypsum board may be required in certain instances.

### **Gypsum Drywall – No Adhesive**

As permitted by code (USA IRC Table R702.3.5; Canada NBC 9.29.5.3) fasten drywall to the R-ETRO Plus Tie flanges on 24" [610mm] spacing horizontally with drywall screws. Fasten to each row of ties, so the vertical spacing is 12" [305mm]. Screws are a must, as nails will not adequately adhere in the plastic ties.

### **Gypsum Drywall – With Adhesive**

As permitted by code (USA IRC Table R702.3.5; Not permitted in Canada) fasten drywall to the R-ETRO Plus Tie flanges on 24" [610mm] spacing horizontally with drywall screws. Fasten to every other row of ties, so the vertical spacing is also 24" [610mm]. Screws are essential, as nails will not adequately adhere in the plastic ties.

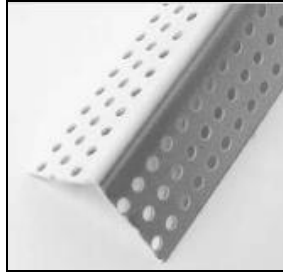
If other finishes (panel products, stucco, acrylic finishes, natural materials) are to be used, they **MUST** either have a rating as a 15 minute thermal barrier, or be installed over min. ½" [12.7mm] gypsum drywall.

### Stucco and Acrylic Finishes

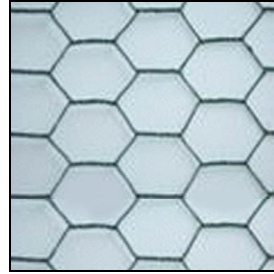
#### Off-The-Shelf Components:



Stucco



Corner Bead



Wire Mesh



Wind-lock Fasteners  
& Decking Screws

For application of troweled-on or sprayed-on finishes, a thin layer of base coat should be applied to the corner to adhere a pre-manufactured corner bead, which will continue up the entire height of the corner. The corner bead will provide a more substantial substrate to resist chipping of the corner. Foam shapes may be glued to any corner to give a relief effect to the corner.

Apply cementitious stucco or acrylic finishes according to manufacturer's instructions. Wire mesh can be mechanically fastened to tie flanges with Wind-locks and exterior rated screws. Nylon mesh or fabric will be adhered with base coat over the Plus Panels that have been lightly textured with a foam rasp. Attractive relief features, like 'V grooves' can be cut into the Plus Panels with a hot knife or router. Built-up foam shapes can be purchased and applied to the Plus Panels with foam to foam spray adhesive.

In window openings, the small joint between the Plus Panels and the existing building can be spanned with the finish material and mesh. (See previous section on "Windows and Other Openings".) Stucco or acrylic finishes can be wrapped around exterior of openings terminated against the window frame and sealed with caulking.

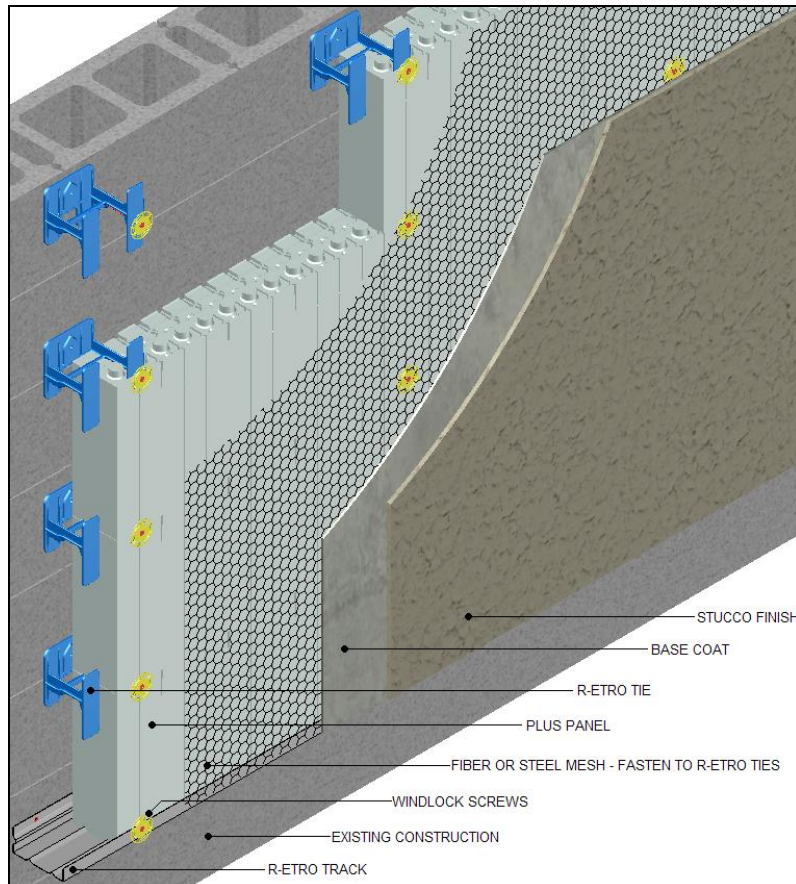


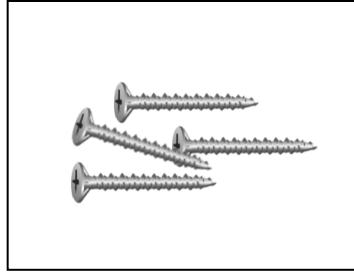
Figure 28: Stucco & Acrylic Finish Details

## Panel Products Finishes

### Off-The-Shelf Components:



Panel Siding



Grabber Screws

Sheet goods, like fiber cement panel siding, can be applied to the R-ETRO System. The layout of the R-ETRO Plus Tie flanges should be clearly marked on the surface of the foam with a chalk line or felt pen. Panel materials can be screwed to the tie flanges with exterior rated screws, as specified by the siding manufacturer. The use of the Plus FS Panel will make this application easier.

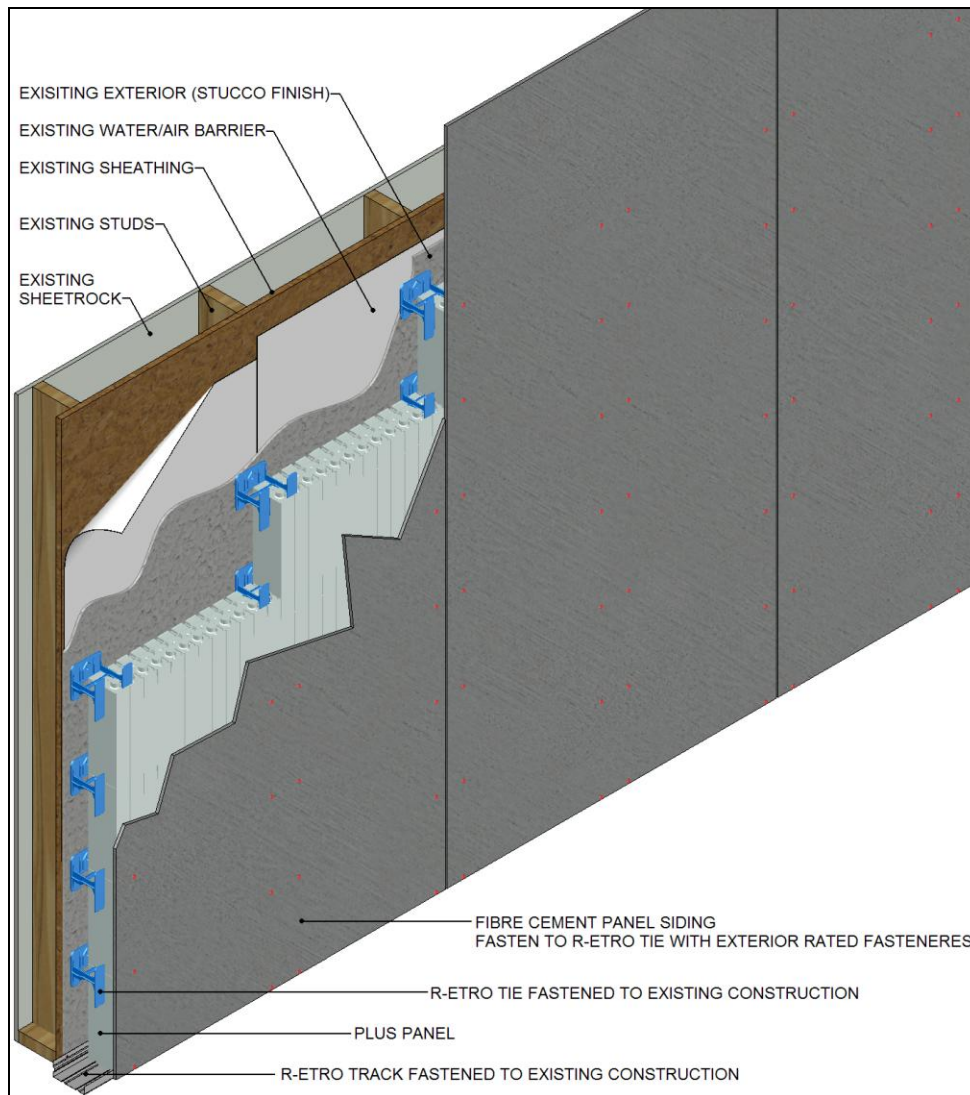


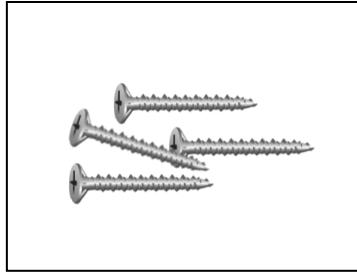
Figure 29: Panel Details

### Lapped Siding Finishes

#### Off-The-Shelf Components:



Cladding System



Grabber Screws

Use the Plus FS Panels to provide a continuous vertical fastening strip at 12" [305mm] to 24" [610mm] centers, depending on the R-ETRO Plus Tie spacing. Exterior rated screws are used to fasten lapped siding at any desired exposure. "Blind" fastening is recommended in most instances, where each top row of fasteners is covered by the bottom of row of siding above. "Face" (or exposed) fastening may be required in areas of high wind speed.

Panel or lapped siding will require the installation of a wider window sill and flashing.

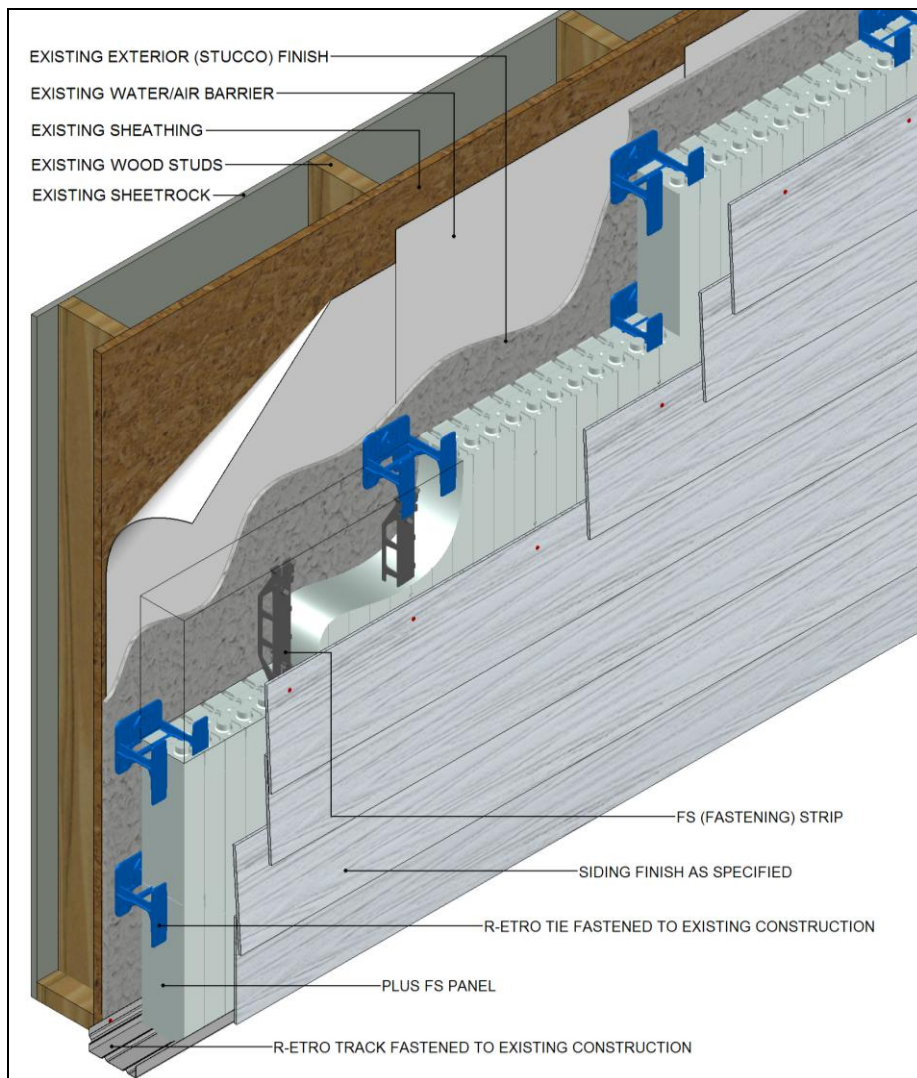


Figure 30: Lapped Siding Detail Using Plus FS Panel

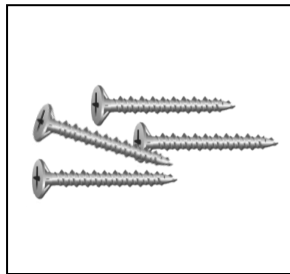


## Shingle Finishes

### Off-The-Shelf Components:



Shingle Siding



Grabber Screws



Furring



Staple Gun & Staples

The application of shingles is possible with the R-ETRO System, with an appropriate furring strip pattern applied. It may be necessary to apply vertical furring strips at 12" [305mm] to 24" [610mm] spacing, and then a horizontal furring strip to support the shingles at the desired exposure length. It is recommended to use spray foam adhesive and screws on furring strips that are applied directly to the R-ETRO System.

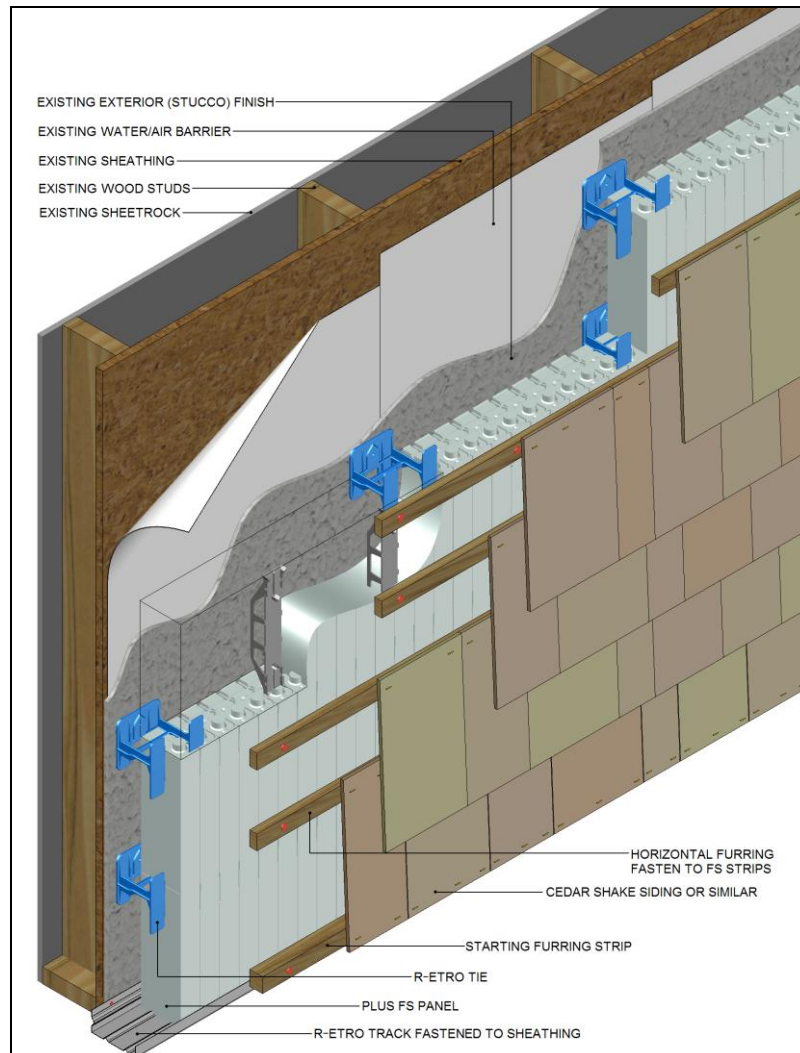


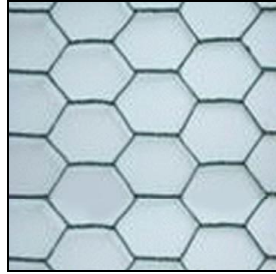
Figure 31: Shingle Placement Detail

### Cultured Stone or Brick Finishes

#### Off-The-Shelf Components:



Brick



Wire Mesh



Adhesive Grout



Wind-lock Fasteners  
& Decking Screws

Application of cultured stone or brick is possible, depending on the loading requirements of the system. In general, a wire lath is applied to the substrate to help support the stone or brick materials in combination with a layer of adhesive base mudding. Wire lath can be attached directly to the R-ETRO Plus Tie flanges with Wind-lock fasteners and exterior-rated screws. Adhesive mudding is then troweled over the foam and wire lath. Check with the manufacturer regarding the requirements for loading on the substrate. Additional fasteners may be required in the instance of heavy loading. Call the Quad-Lock Training and Technical Services Department for more information.

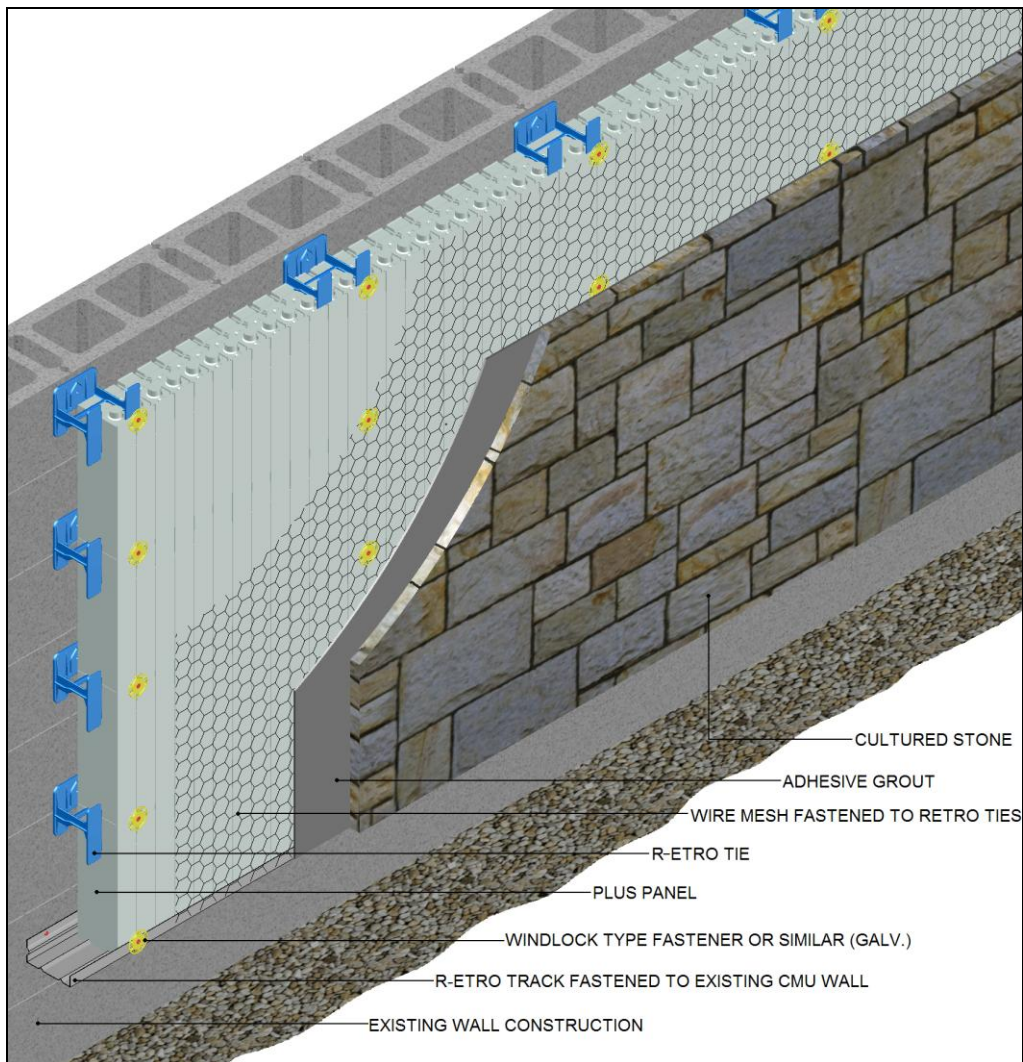
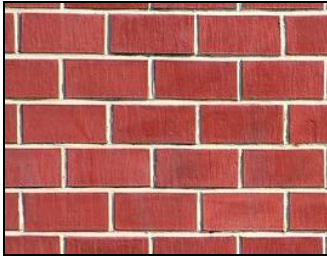


Figure 32: Cultured Stone Detail

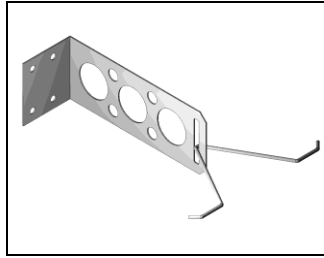


## Natural Stone or Brick Finishes

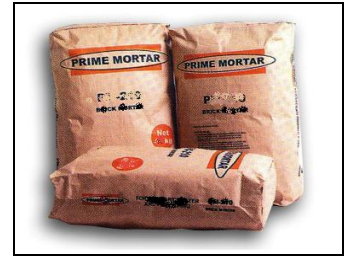
### Off-The-Shelf Components:



Natural Stone or Brick



Brick Ties



Mortar

If a natural stone or full brick finish is desired, there must be a provision for a tie-back system to support the finish layer against the building. In this case, it is recommended that an engineer's approval be obtained on the tie-back method to ensure adequacy of loading values versus the loads generated by the finish materials. Straps can be attached to the existing building and extended through the Plus Panels into the finish stone or brick layer. Alternatively, metal ties may be screwed to the flanges of the R-ETRO Plus Ties and used to support the finish layer. For exterior applications, all ties and fasteners must be weather resistant and rated for exterior use.

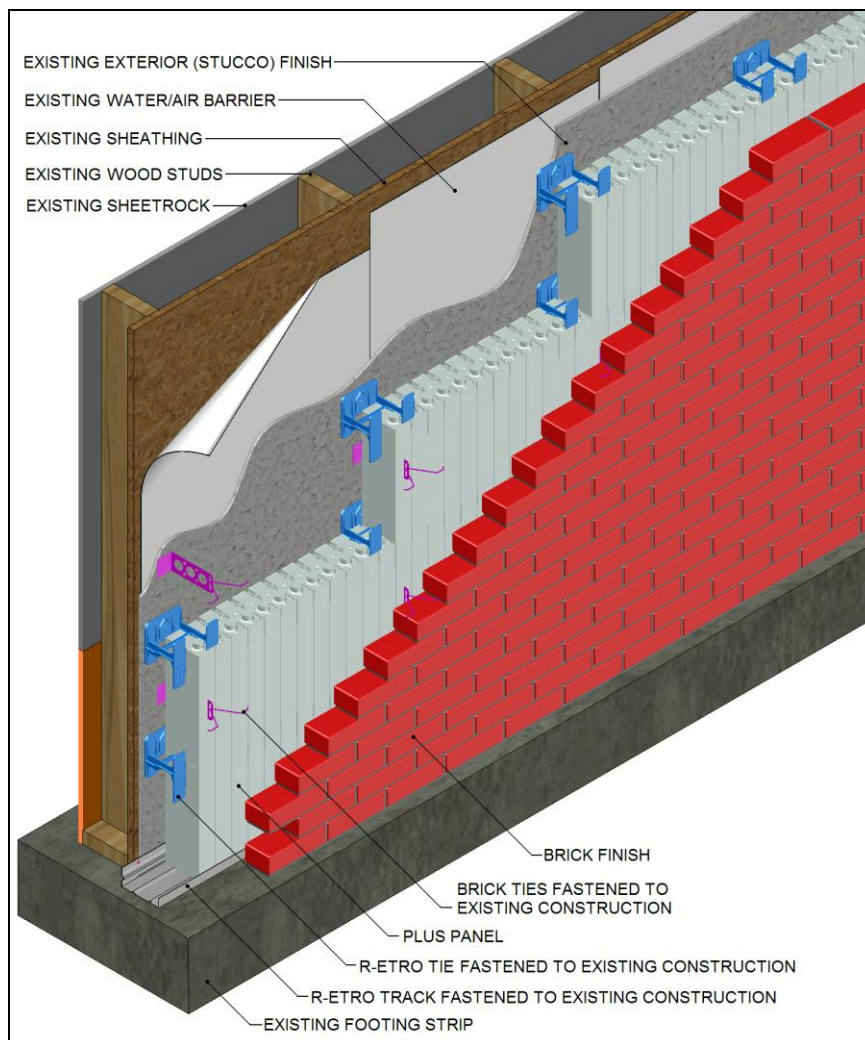


Figure 33: Brick Detail

# APPENDIX A – TECHNICAL SPECIFICATIONS

## TECHNICAL SPECIFICATIONS FOR EPS PANELS

		Imperial	Metric
DIMENSIONS*:	Plus Panel	48" x 12" x 4¼"	1219 x 305 x 108mm
COLOR*:	GRANITE		
EPS DENSITY*:	Plus Panel	1.5 lb/cuft ± 7%	24.0 g/l ± 7%
EPS BEAD TYPE*:	FIRE RETARDANT		
FLEXURAL STRENGTH*:	(ASTM C-203)	min. 40 PSI	min. 276kPa
COMPRESSIVE STRENGTH*:	(ASTM D-1621)	32 PSI	222kPa
SHEAR STRENGTH:	(ASTM C-273)	38 PSI	262kPa
TENSILE STRENGTH:	(MIL-P-19644)	60 PSI	414kPa
WATER VAPOR PERMEANCE*:	(ASTM E-96)	0.25 perm/in	14.3 ng/Pa.sm. <sup>2</sup>
WATER ABSORPTION (96hr)*:	(ASTM D-2842)	2.7%	2.7%
DIMENSIONAL STABILITY:	(ASTM D-2126)	0.26%	0.26%
COEFFICIENT OF EXPANSION*:	(ASTM D-696)	3.5 x 10 <sup>-5</sup> in/in°F	1.94 x 10 <sup>-5</sup> m/m°C
ALLOWABLE DIMENSIONAL TOLERANCES*:		1/8"	3.3mm
FLASH IGNITION TEMP.:	(DIN 54836, Styropor, BASF)	715°F	379°C
SELF-IGNITION TEMP. (EXPANDED):	(ASTM D1929 Expanded Polystyrene, Huntsman)	880°F	471°C
FLAME SPREAD:	(ASTM E84/CAN/UCC-S 102.2M)	25 max	140 – 180
SMOKE DEV.:	(ASTM E84/CAN/UCC-S 102.2M)	450 max	over 380
EPS RAW MATERIAL SUPPLIERS:	ARCO BASF HUNTSMAN STAREX SAMSUNG NOVA CHEMICALS	NER # 236 Dec. 1, 1992 NER # 479 June 1, 1993 NER # 384 May 1, 1992 ESR-2195 February 1, 2007 ESR-1798 October 1, 2006	

\* tested for Quad-Lock



# MATERIAL SAFETY DATA SHEET

Quad-Lock Building Systems Ltd.  
7398 - 132nd Street  
Surrey, BC V3W 4M7  
Canada

**MATERIAL SAFETY DATA SHEET**  
Effective November 2004

## PRODUCT INFORMATION

Product: Quad-Lock Panels moulded EPS – expanded polystyrene  
Product Types: ASTM C578 Types: The rigid cellular EPS insulation complies with ASTM C 578-95 as flows:  
Regular Panels are Type III in Canada and type IX in US, and Plus Panels are Type II in Canada and US  
Chemical Family: polystyrene thermoplastic  
CSA Name: benzene, ethenyl-, homopolymer (9003-53-6)  
Chemical Formula: (C<sub>8</sub>H<sub>8</sub>)  
TSCA Inventory Status: Listed

## HAZARD RATING DATA

Health 0  
Fire 1 self extinguishing material  
Reactivity 0

0=minimal 2=moderate 3=serious 4=severe

## COMPONENTS DATA

Hazardous Components:  
Pentanes (CSA Registry No. 109-66-0) <0.6% by weight  
Flame retardant as brominated organics: Hexabromocyclododecane (CSA Registry No. 25637-99-4) 0.9% max.  
Non-Hazardous Components:  
Polystyrene (CSA Registry No. 9003-53-6) 95.1% by weight min.  
Water (H<sub>2</sub>O) 3.4% by weight max.

## PHYSICAL DATA

Form:	Rigid cellular foam shapes	Specific Gravity (water=1): 0.014 to 0.032
Colour:	light gray/blue	Vapor Pressure: N/A
Odor:	very slight hydrocarbon odor	Volatiles by vol.: <4% (pentanes and water)
Boiling Point:	N/A	Vapor Density (air=1): N/A
Melt Point:	softens at 175°F	Evaporation Rate: none

## FIRE AND EXPLOSION DATA

Flash Point: 610°F (ASTM D1929) Auto-Ignition Temp: 850°F  
This material contains a flame retardant – industry designation is “self extinguishing”. Special Fire Fighting Instructions:  
Use approved self-contained breathing apparatus respirator and personal protective clothing (turn out gear).  
Extinguish Media: Water fog, carbon dioxide, dry chemical foam.  
Unusual fire and explosion hazards: May produce dense black smoke. Smoke contains carbon soot, carbon monoxide and water. Dust generated by fabricating, i.e. cutting, sawing, etc., will increase fire hazards and should be handled accordingly.

## REACTIVITY DATA

Stability (conditions to avoid):	Stable, avoid fire and high temperatures.
Incompatibility (materials to avoid):	Will dissolve in most organic solvents and amines.
Products of Decomposition:	Carbon monoxide, carbon dioxide and water.
Hazardous Polymerization:	None.

# **APPENDIX B – CODE REFERENCES**

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## **Electrical**

### **NEC 300.4 (USA)**

Where cables are installed through bored holes in joists, rafters, or wood framing members, the holes shall be bored so that the edge of the hole is not less than 1¼" from the nearest edge of the wood member. Where this distance cannot be maintained, or where screws or nails are likely to penetrate the cable, it shall be protected by a steel plate at least 1/16" [1.6mm] thick and of appropriate length and width. \*\*

### **NEC 300.14 (USA) | CEC Part 1, 12-3000(5) (Canada)**

The minimum length of conductors, including grounding conductors, at all boxes shall be 6" [150mm]. At least 3" [75mm] shall extend outside the box.

### **NEC 334.30 (USA) | CEC Part 1, 12-3022 (Canada)**

Type NM (nonmetallic) cable shall be secured at intervals not exceeding 4.5' [1.4 m] and within 12" [300mm] of each box.

### **NEC 314.16 (USA) | CEC Part 1, 12-3034 (Canada)**

The volume of electrical boxes shall be sufficient for the number of conductors, devices, and cable clamps contained within the box. Nonmetallic boxes are marked with their cubic inch capacity.

### **NEC 110.14 & 300.15 (USA)**

Splices shall be made with an approved splice cap or "wire nut" and shall be made in approved electrical boxes or enclosures.

### **NEC 314.19 (USA) | CEC Part 1, 12-3014 (Canada)**

Junction boxes shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building.

### **NEC 110.12 & 314.17 (USA) | CEC Part 1, 12-3024 (Canada)**

Unused openings in boxes shall be effectively closed. When openings in non-metallic boxes are broken out and not used, the entire box must be replaced.

*\*\*This applies to electrical cable installed in Plus Panels as well. The stated minimum depth must be maintained from the surface of the foam to the cable.*

## **Foamed Plastic Insulation**

### **IRC R314.1 to R316 (USA)**

Outlines requirements for use of foam plastic insulation in residential structures, including surface burning characteristics, use of thermal barriers, use in attics and crawlspaces and termite damage.

### **IBC Chapter 26, Section 2603 (USA)**

Outlines requirements for use of foam plastic insulation in non-residential structures, including surface burning characteristics, use of thermal barriers, use in attics and crawlspaces, and termite damage.

### **NBC Part 9, Section 9.10.17.10 (Canada)**

Outlines requirements for protection of foamed plastics in residential structures.

### **NBC Part 3, Sections 3.1.4.2 & 3.1.5.12 (Canada)**

Outlines requirements for protection of foamed plastics in non-residential structures.

**Example of some links to helpful government sites:**

<http://dbs.idaho.gov/electrical/Home%20owner.pdf>  
[http://www.electricity.state.mn.us/pdf/rei\\_inspection\\_checklist.pdf](http://www.electricity.state.mn.us/pdf/rei_inspection_checklist.pdf)  
[http://www.ci.watertown.mn.us/documents/electrial\\_inspection\\_handout.pdf](http://www.ci.watertown.mn.us/documents/electrial_inspection_handout.pdf)  
[http://www.marioncountyfl.org/bu341/BU\\_Forms/BU\\_InspectionGuidelinesElectrical.pdf](http://www.marioncountyfl.org/bu341/BU_Forms/BU_InspectionGuidelinesElectrical.pdf)  
<http://www.ci.lakeville.mn.us/departments/departmentspdf/ElectricalPermits.pdf>  
[http://www.gov.on.ca/ont/portal/!ut/p/.cmd/cs/.ce/7\\_0\\_A/.s/7\\_0\\_252/s.7\\_0\\_A/7\\_0\\_252/l/en?docid=STEL02\\_037881](http://www.gov.on.ca/ont/portal/!ut/p/.cmd/cs/.ce/7_0_A/.s/7_0_252/s.7_0_A/7_0_252/l/en?docid=STEL02_037881)  
[http://www.bconline.gov.bc.ca/pdf/elec\\_permits\\_web.pdf](http://www.bconline.gov.bc.ca/pdf/elec_permits_web.pdf)

A search of your state or provincial websites will reveal code jurisdiction for region-specific information.

Refer to our website for other helpful links – [www.r-etrol.com](http://www.r-etrol.com).

## APPENDIX C – FASTENING REQUIREMENTS

The provisions of this section shall apply to the construction buildings not greater than 60' [18.3m] in plan dimensions, and floors not greater than 32' [9.7m] or roofs not greater than 40' [12.2m] in clear span. Buildings shall not exceed two stories in height above-grade. Walls constructed in accordance with the provisions of this section shall be limited to buildings subjected to a maximum design wind speed of 150 miles per hour [67 m/s], and Seismic Design Categories A, B, C, D0, D1 and D2.

- Vertical spacing is always 12" [305mm] for R-ETRO Ties
- All screws used on the exterior to be exterior rated.
- Screw size assumes 0.25" [6.35mm] of thread to be lost on R-etro Tie thickness.
- Factor of Safety = 3.
- Maximum finish weight (Shear) not to exceed 50psf [2.4kPa] for plywood and 70psf [3.4] for concrete and block construction.

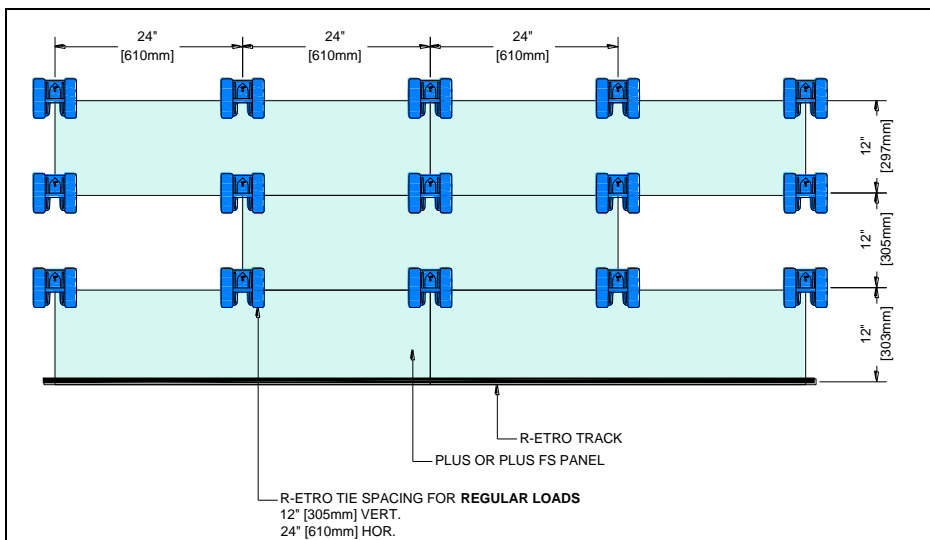


Figure 34: Tie-Placement – Regular Load - 24" O.C. horizontal

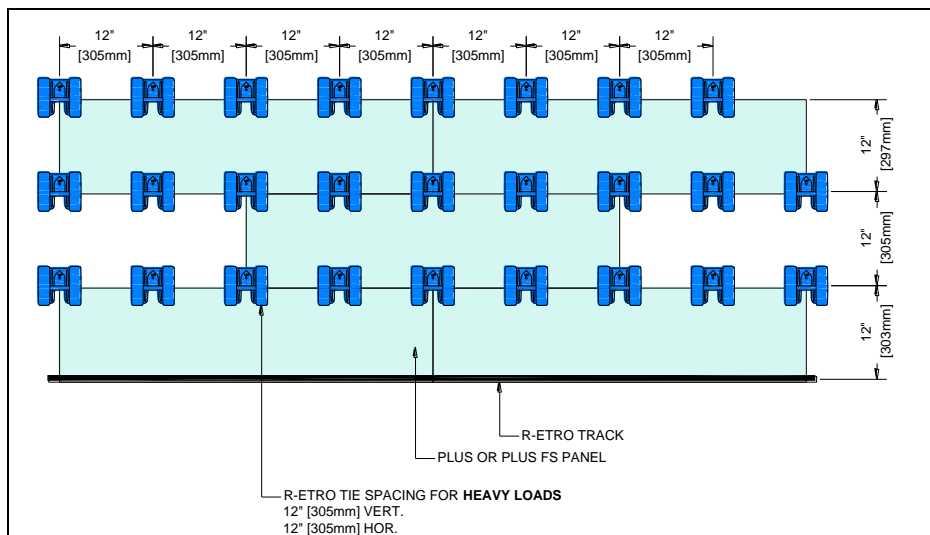


Figure 35: Tie Placement – High Load - 12" O.C. horizontal

## INTERIOR FASTENING REQUIREMENTS

### IMPERIAL

Loading	R-ETRO Plus Tie O.C. Distance (inches)	SCREW SIZE		
		Concrete	Hollow Block	1/2" Plywood
		Tapcon Screw Length & Diameter	Tapcon Screw Length & Diameter	Wood Screw Length and Diameter
1/2" Drywall	24	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
Drywall + 5 psf	24	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
Drywall + 10 psf	24	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
Drywall + 20 psf	24	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
Drywall + 30 psf	24	1.25" x 3/16"	1.25" x 1/4"	1.25" x #8
Drywall + 40 psf	24	1.25" x 3/16"	1.25" x 1/4"	1.25" x #8

### METRIC

Loading	R-ETRO Plus Tie O.C. Distance (mm)	SCREW SIZE		
		Concrete	Hollow Block	13mm Plywood
		Tapcon Screw Length & Diameter	Tapcon Screw Length & Diameter	Wood Screw Length and Diameter
12mm Drywall	610	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
Drywall + 0.24 kPa	610	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
Drywall + 0.48 kPa	610	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
Drywall + 0.96 kPa	610	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
Drywall + 1.45 kPa	610	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.0mm
Drywall + 1.92 kPa	610	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.0mm

## EXTERIOR FASTENING REQUIREMENTS

### IMPERIAL

Design Wind Pressure (psf)	R-ETRO Plus Tie O.C. Distance (inches)	SCREW SIZE		
		Concrete	Hollow Block	1/2" Plywood
		Tapcon Screw Length & Diameter	Tapcon Screw Length & Diameter	Wood Screw Length and Diameter
0 - 30	24	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
30 - 40	24	1.25" x 3/16"	1.25" x 1/4"	1.25" x #8
40 - 60	24	1.25" x 3/16"	1.25" x 1/4"	1.25" x #10
60 - 80	12	1.25" x 3/16"	1.25" x 3/16"	1.25" x #6
80 - 100	12	1.25" x 3/16"	1.25" x 1/4"	1.25" x #8
100 - 115	12	1.25" x 3/16"	1.25" x 1/4"	1.25" x #10

### METRIC

Design Wind Pressure (kPa)	R-ETRO Plus Tie O.C. Distance (mm)	SCREW SIZE		
		Concrete	Hollow Block	13mm Plywood
		Tapcon Screw Length & Diameter	Tapcon Screw Length & Diameter	Wood Screw Length and Diameter
0 - 1.45	610	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
1.45 - 1.92	610	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.0mm
1.92 - 2.87	610	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.8mm
2.87 - 3.83	305	32mm x 4.8mm	32mm x 4.8mm	32mm x 3.6mm
3.83 - 4.79	305	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.0mm
4.79 - 5.51	305	32mm x 4.8mm	32mm x 6.35mm	32mm x 4.8mm

### Notes: