

936 Connect

Composite Wall Weatherization System

July 2021

The following document, Technical Data, Code Compliance, Application Instructions and Best Practices for Installing 936 Connect on Low Rise Wood Framed Structures is a living, work in progress document. 936 Connect is arguably the most technologically advanced wall weatherization system in North America. 936 achieves NBCC compliance. Technical updates will be added as they become available. Thank you for your interest in the composite 936 Connect Wall Weatherization System. Questions, please contact Ted Cullen ... ted@quiktherm.com

Who is Quik-Therm?

Over the past 12 years Quik-Therm Insulation Solution Inc. (QT) has collaborated with many of North America's finest Building Science engineering and testing organizations. QT has conducted 70+ ASTM standard test procedures - including 30+ C1363 effective R-value tests, numerous hygrothermal analyses - physical wall drainage and drying assembly tests.

As a consequence of our investment in building science and research, Quik-Therm has been able to design and develop several physics based, multi-functional weatherization/insulation technologies (systems). QT systems most often cost less, install faster and perform better than status quo insulation products and installation methods.

Quik-Therm weatherization technologies have been utilized in Canada's largest and second largest Passive House Buildings and the Home of Tomorrow. The Nuutsumuut Lelum, Nanaimo Aboriginal Centre Passive House project may well be the lowest cost, best performing Passive House building in Canada.

Technical Data, Code Compliance, Application Instructions and Best Practices for Installing 936 Connect on Low Rise Wood Framed Structures

Components: Perforated metallic polymer facers - laminated over Type 2 expanded polystyrene with Inherent $\frac{3}{4} \times 2\frac{1}{2}$ " wide plywood furring/nailing strips every 16" O.C.

Dimensions: 4' x 8' Rigid Sheets - 2¹/₂" Thick

CCMC Listing: 13457-L

A. Product Description

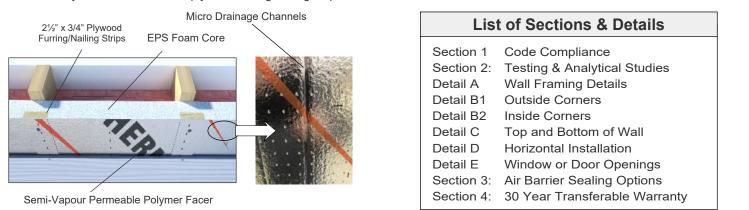
936 Connect is a composite Lean Construction, low cost, energy and carbon saving wall weatherization system. 2x4 framed 936 Connect walls cost less, install faster and provide 30%+ superior effective R-value performance compared to 2x6 minimum code wall assemblies. In Canada, 9.36 applies to energy efficiency code requirements as they apply to construction of new homes and small buildings. 936 Connect is 9.36 National Building Code compliant.

C. Technical Advantages

B. Scope & Purpose

This document describes the recommended best practices for installing 936 Connect (936) in wood framed structures. Specific installation conditions and environment may warrant digression from these instructions. In all instances, refer to the notes included with each installation schematic to ensure the technical advantages of the product are maintained. **** Adhere to local building codes.

Moisture resistant, semi-vapour permeable continuous insulation system consisting of just three fundamental components. There is no requirement for exterior substrate sheathing, house wrap or 6 mil poly. The pre-tension clamping design seals the all-encompassing air, vapour and thermal control layer to the wall framing system. The service stud bays contain 3.5" cavity batt insulation. Perforated polymer facers allow the wall assembly to dry (diffuse) vapour both outward (winter) and inward (summer). There is no potential for a double vapour barrier. Exterior vertical micro drainage channels and furring that is 2mm proud of the exterior facer promote gravity induced drainage and drying between 936 Connect and exterior cladding. Tongue and Groove connections aide in structure and panel alignment. Cladding is mechanically fastened to inherent plywood furring/nailing strips.



Quik-Therm Insulation Solutions Inc.



936 Connect

Section 1 Code Compliance

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Page 2 of 11 July 2021

National Building Code Canada

Canadian Provinces typically adopt the National Building Code of Canada (NBCC) as their Provincial codes; however, some Provinces and Municipalities may add additional information reflecting modifications, to their Provincial code, to meet local needs and concerns. Compliance with the code is achieved by complying with the acceptable solutions of Division B of the code. Division B lays out the steps that must be followed, beginning with the geographic location where the build is taking place.

1a. Can a Part 9 building be constructed in Canada with rigid foam plastic insulation sheathing in lieu of plywood, OSB or exterior gypsum?

Yes! Article 9.23.17.1. Required Sheathing Table 9.23.17.2.-A, Wall Sheathing and Thickness and Specifications lists permitted materials for use as sheathing in a Part 9 building. Polystyrene, expanded polystyrene (EPS) Types 1 and 2, meeting the CAN/ULC - S701.1 Material Standard are permitted in lieu of plywood, OSB and gypsum sheathing in a Part 9 building.

1b. Does Quik-Therm 936 Connect meet the requirements of NBCC Articles 9.23.13.1. Requirements for Low and Moderate Wind and Seismic Forces?

Yes! 936 meets the requirements of NBCC Article 9.23.13.1.(1) by complying with the design data in Table C-2, applicable geographic zones. 936 also meets the requirements of sentence 9.23.13.1(2). by complying with Sub-clause 9.23.13.1.(2)(a)(iii).

1c. Can foam sheathing be used on the exterior of a Part 9 building?

Yes! Yes. Foam plastics can be used on the exterior and interior of a Part 9 building as long as it is protected from adjacent space in the building by a thermal barrier as outlined in NBCC Article 9.10.17.10. Protection of Foamed Plastics. 936 Connect meets this requirement by complying with Clause 9.10.17.10.(1)(a).

 Quik-Therm Testing:
 ASTM E330/E330M
 Structural Performance of Windows, Doors, Skylights and Curtain Walls.

 TAS 1 24-95
 Adhesion Testing for Laminated Polymer Films.

2. Does the NBCC require 2x6 studs when constructing a Part 9 building?

No! Article 9.23.10.1. Stud Size and Spacing Article 9.23.10.1. Stud size and Spacing in the NBCC, defines stud size and spacing allowed in Part 9 construction. Table 9.23.10.1. lists supported loads, minimum stud size, maximum stud spacing and the maximum unsupported height (of the stud), for use in interior and exterior walls. For exterior walls supporting a "Roof with or without attic storage plus one floor",2x4 studs, spaced 16" O.C., to a maximum unsupported height (length of the wall stud) of 3.0 meters, are permitted for use in a Part 9 building.

Quik-Therm Testing: ASTM E330/E330M Structural Performance of Windows, Doors, Skylights and Curtain Walls.

3. Is polyethylene required for use as a vapour barrier in Part 9 construction?

No! Article 9.25.4.2. Vapour Barrier Materials Thermally insulated, heated buildings must have a vapour control layer incorporated into the building envelope (exterior walls) of a building, to prevent water vapour diffusion from the interior of the building, entering into the wall spaces. Article 9.25.4.2. of the NBCC describes a vapour barrier as a material having a vapour permeance, not greater than 60 ng/(Pa.s.m2) and requires it to be installed on the interior (warm side) of insulated walls, floors and roof spaces. Sentence four [9.25.4.2.(4)] permits the use of coatings to the drywall, such as vapour barrier paints with a vapour permeance ranging from between 45-60 ng/(Pa.s.m2) to act as the vapour control layer of the building envelope, in lieu of six mill poly.

Quik-Therm Testing: ASTM E96 Water Vapour Permeance.

ASTM E331 Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls. Hygrothermal Analysis of Quik-Therm 936 Connect Wall.

4. Is an Air Barrier required in Part 9 Construction?

Yes! Article 9.25.3.1. Required Barrier to Air Leakage and 5.4.1.2. Air Barrier System Properties. An air barrier is required in wall, ceiling, and floor assemblies separating a heated space from an unconditioned space. Air barrier systems must create an effective barrier to air infiltration and exfiltration when exposed to a differential air pressure, from, stack effect, mechanical system's or wind. Materials used as an air barrier must have an air leakage of not greater than 0.02 L /(s.m2) measured at a pressure difference of 75 pascals (Pa), when tested in accordance to ASTM E 2178. Note: Quik-Therm performed two ASTM 2178 air permeance tests - one with laminates not breached and the other with laminates breached. The results from both tests met the requirements of an air barrier, as outlined in Section 5.4.1.2. in Division B, of the NBCC.

 Quik-Therm Testing:
 ASTM E2178
 Product Air Barrier Testing.

 ASTM E2357
 Air Leakage Rate of Air Barrier Assemblies.

 ASTM E1186
 Air Leakage Detection in Building Envelopes and Air Barrier Systems.

 ASTM E331
 Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls.

 Hygrothermal Analysis of Quik-Therm 936 Connect Wall.



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936 Connect

Section 2 **Testing & Analytical Studies**

Page 3 of 11

July 2021

Quik-Therm Insulation Solutions Inc.

Inspired by Building Science

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Air Barrier & Air Leakage Testing

ASTM E2178 Product Air Barrier Testing. QAI Laboratories. Semi-permeable (breached/perforated polymer films) meets the requirements of an air barrier as outlined in Section 5.4.1.2 (Division B) of the National Building Code of Canada.

ASTM E2357 Air Leakage Rate of Air Barrier Assemblies. Red River College (BETAC).

ASTM E1186 Air Leakage Detection in Building Envelopes and Air Barrier Systems. Red River College (BETAC).

Hygrothermal Analysis

Hygrothermal Analysis of Quik-Therm 936 Connect Wall. Patrick Roppel, P.Eng., Sophie Mercier, P.Eng. Building Science Specialists, Evoke Buildings Engineering Inc. The Quik-Therm 936 Connect wall meets the prescriptive

requirements in the 2015 NBC for thermal insulation (925.2), air barrier system (9.25.3), vapour barriers (9.25.4), and position of materials in the building envelope (9.25.5).

Tape Peel Adhesion Testing

Tested to ASTM D 3330, Method A. 3M considers the bond of 3M 3015, Air and Vapour Barrier tape to Quik-Therm insulation to be adequate and the products to be compatible.

Effective Thermal Resistance

In addition to nominal R-Value testing as per ASTM C518, standard prescriptive calculation methods and independent evaluations, Quik-Therm Insulation Solutions Inc. has undertaken a program of full-scale thermal performance testing to ASTM C1363-05 "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus."

Method	Test Company	Test Assembly	R-Value
ASTM C-518	ATI/Intertek	1" Type 2 Quik-Therm Connect	4.18
ASTM C-1363	ATI/Intertek	3/8 drywall, 6 mil poly vapour barrier, empty 2x4 cavity, 7/16" OSB, 2" Connect, 1/4" cement board siding	13.2
ASTM C-1363	ATI/Intertek	3/8" drywall, 6 mil poly vapour barrier, R-13 batt (2x4 cavity), 7/16" OSB, 2" Connect, 1/4" cement board siding	23.1
Canadian Effective R-Value Evaluation	Morrison Hershfield	1/2" drywall, R-12 batt, 7/16" OSB, 2" Connect, cement board	22.1
Prescriptive Effective R-Value Calculation	Minimum R-value Calculations	Interior Air Film (R-0.17) + 1/2" drywall (R-0.45) + R-12 fiberglass (R-9.8) + 2½" Type 2 Connect (R-10.45) + typical cladding materials (R-0.4) + Exterior Air film (R68)	22.0

Water and Vapour Barrier Testing

ASTM E96 Water Vapour Permeance. QAI Laboratories. Average water vapour permeance of 87.30 ng/Pa·s·m2 (1.53 US Perms). Perforated 936 Connect is deemed vapour semi-permeable.

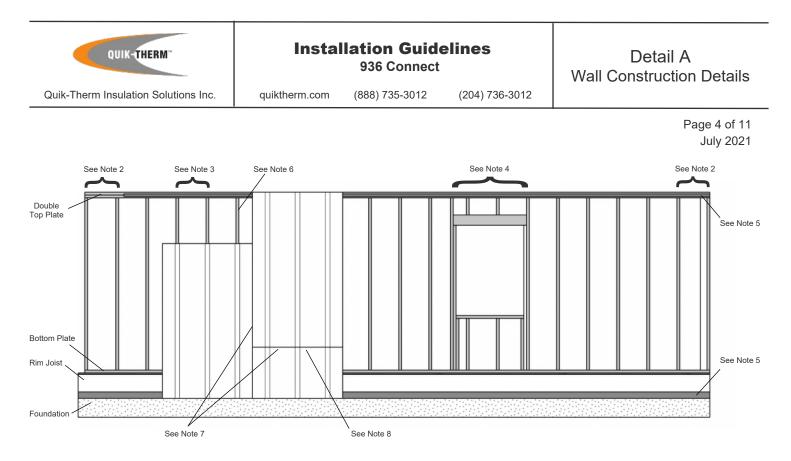
ASTM E331 Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls. Red River College (BETAC). Detects water leakage utilizing high pressure water. Simulates driving rain.

Structural Testing

(204) 736-3012

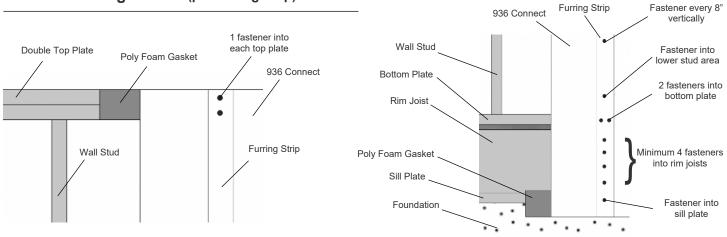
ASTM E330/E330M Structural Performance of Windows, Doors, Skylights and Curtain Walls, Red River College (BETAC). Withstood 1500 pascals. Equivalent to 178 km/h sustained wind speed. Minimal deflection. No drywall, exterior sheathing or cladding. Just 2" thick 936 Connect nailed over 2x4 framing @16" OC. No Bracing.

TAS 1 24-95 Adhesion Testing for Laminated Polymer Films. QCA Building Envelope Ltd. Three test samples. Averaged pull resistance 257 psi / 1,029 psf.



Basic Panel Installation Notes

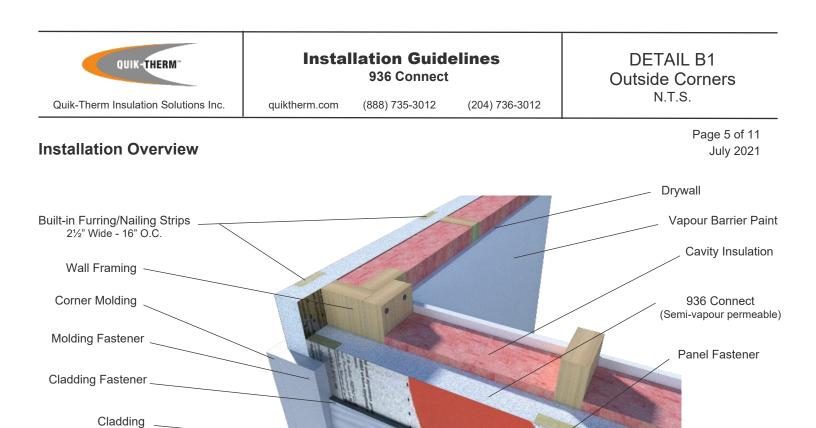
- 1. 6 mil poly, OSB and House Wrap are not required for the 936 assembly. See Hygrothermal Analysis summary on page 3.
- 2. First stud at corner spaced to fasten panel furring strips at corners for attaching corner moldings (Refer to Details B & C).
- 3. Remainder of framing must maintain 16" O.C. TIP: Use 14.5" long temporary blocking to help straighten crooked studs.
- 4. Ensure studs above windows/doors and below windows follow 16" O.C. spacing to accommodate panel installation.
- 5. White 3/16" poly foam gasket over double top plate and sill plate area. Refer to Detail C for top and bottom of wall details.
- Ensure all nailing strips are connected to a framing member as per fastening schedule and penetrate into studs minimum 0.75" (Engineered by Morrison Hershfield).
- 7. Spray foam and/or tape panel connections together. Spray foam is considered best practice. Fill all voids with spray foam.
- 8. Butt end panels together minimum 8" up from bottom plate. Connections can be staggered or in-line. Butt end nailing strips must be connected to a framing member.
- 9. To compress panels tight to framing, stand on nailing strips over studs when fastening.
- 10. It is recommended to use building paper between cementitious stucco and the 936 panel film.



Panel Fastening Details (per furring strip)

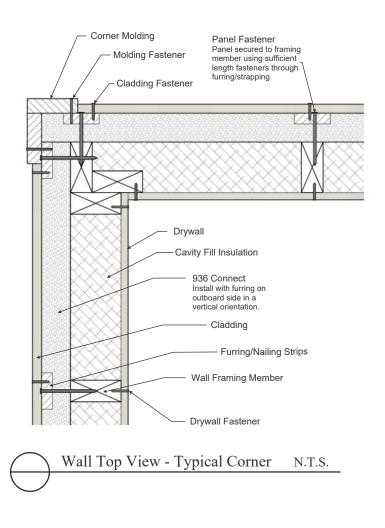
Top of Wall (NTS)

Bottom of Wall and Studs (NTS)



<u>Notes</u>

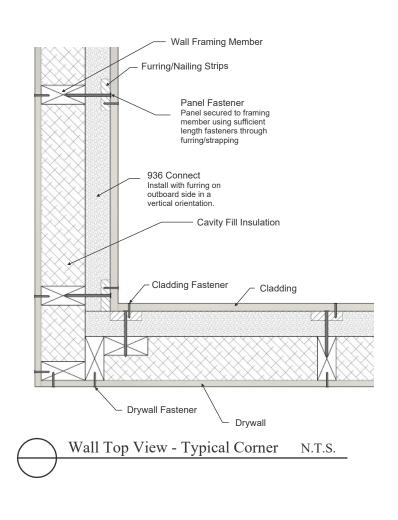
- 1. 6 mil poly, OSB and House Wrap are not required for the 936 assembly. See Hygrothermal Analysis summary on page 3.
- 2. Cut corner panels so that plywood furring strips are fastened to corner framing members as per fastening schedules and penetrate into studs minimum 0.75" (Engineered by Morrison Hershfield).
- 3. Foam corner panels together using canned spray foam. Fill voids with spray foam.
- 4. Ensure corner furring strips are positioned to accommodate secure fastening of corner moldings. Cut panels to achieve overlap at corners.
- 5. It is recommended to use building paper between cementitious stucco and the 936 panel film.
- Typical construction shown. Please refer to design drawings specific to your application. Confirm/consult with a design professional.
- 7. The information presented herein is based upon data considered accurate. Quik-Therm Insulation Solutions Inc. does not assume any responsibility for any misrepresentation or assumptions the reader may formulate. Check with local building codes prior to installing 936 Connect.

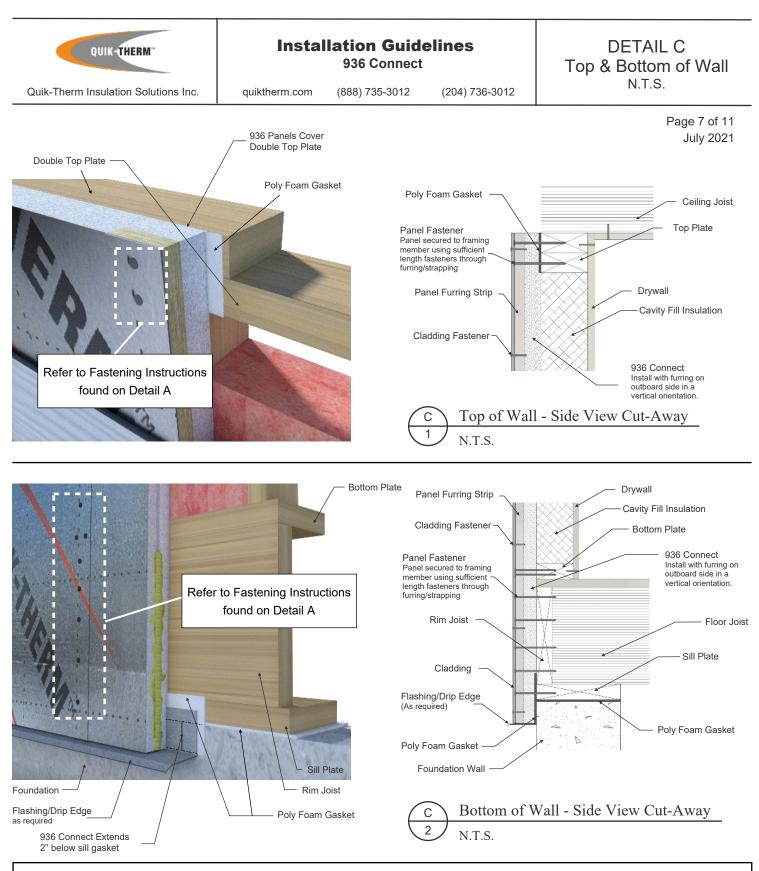




<u>Notes</u>

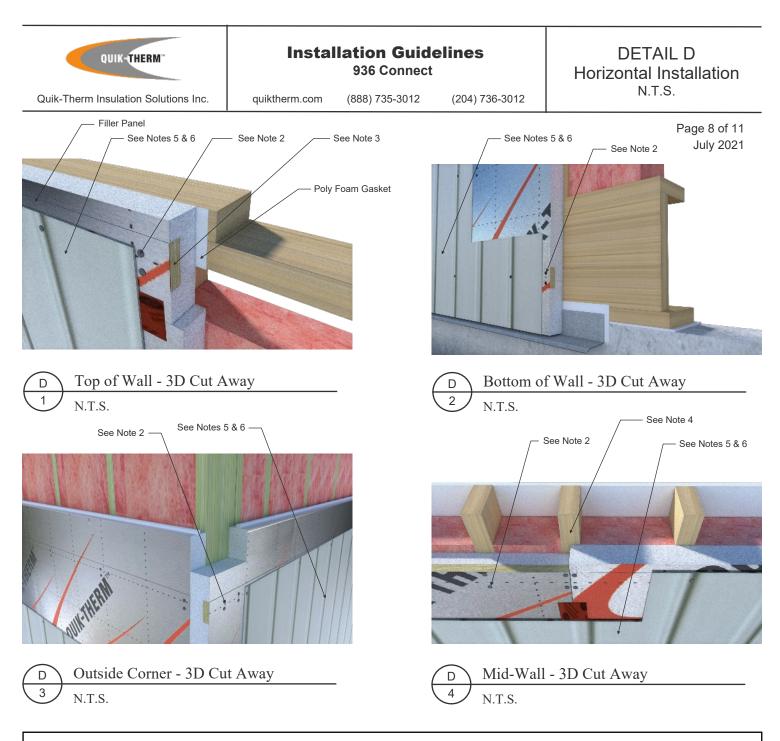
- 1. 6 mil poly, OSB and House Wrap are not required for the 936 assembly. See Hygrothermal Analysis summary on page 3.
- 2. Ensure all nailing strips are connected to framing members as per fastening schedules and penetrate into studs minimum 0.75" (Engineered by Morrison Hershfield).
- 3. Foam panels together using canned spray foam. Fill voids with spray foam.
- 4. Ensure corner furring strips are positioned to accommodate secure fastening of cladding. Cut panels to achieve overlap at corners.
- 5. It is recommended to use building paper between cementitious stucco and the 936 panel film.
- Typical construction shown. Please refer to design drawings specific to your application. Confirm/consult with design professional prior to installing Quik-Therm products.
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<u>Notes</u>

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- 4. Refer to fastening instructions found on Detail A.



Horizontal Installation Notes

- 1. Typical construction shown. Please refer to design drawings specific to your application. Confirm/consult with design professional prior to installing Quik-Therm products.
- 2. Two framing nails (minimum 3.25" long) fasten furring strips to studs, corners, top plates, bottom plate and rim joists.
- 3. Top horizontal furring strip to be fastened maximum 1" from top of top plate.
- 4. Butt ends to connect over studs (just like OSB sheathing). ** For locations where butt ends don't align center over a stud, an extra stud must be incorporated. Studs can be installed conventional or flat orientation.
- 5. Cladding weight. Maximum 5 lb. per sq ft. ** For over 5 lb. cladding and cementitious stucco install 936 Connect in a vertical orientation or as specified by a Design Professional.
- 6. Install cladding per manufacturers recommendations/specifications. It is recommended to use building paper between cementitious stucco and the 936 panel film. Masonry cladding: Consult with a Design Professional.
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DETAIL E Window or Door Openings _{N.T.S.}

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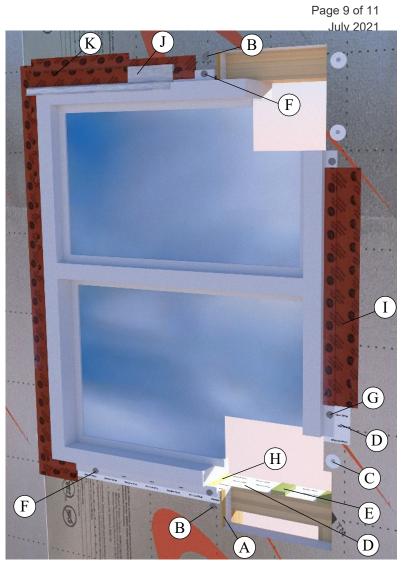
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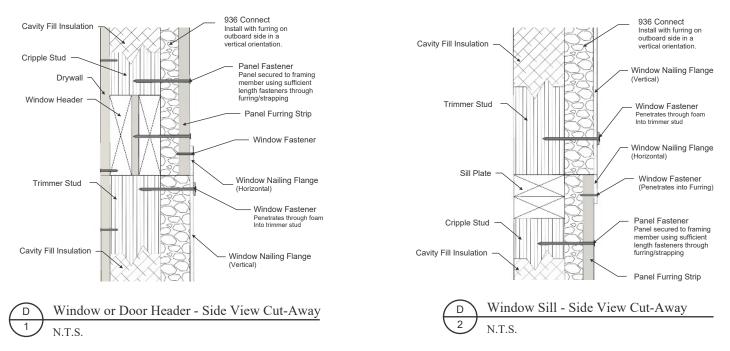
- A. Built-in ³/₄" x 2¹/₂" plywood furring strips.
- B. Built-in furring fastened to top and bottom of window frame.
- C. As required, using fasteners and insulation washers snug rigid insulation to framing.
- D. Window wrap bottom of window and 6" upward on sides or per Designer's specification. Window wrap seals to polymer facer.
- E. Shim to create 1/2" gap between window and rough opening.
- F. Top and bottom of window secured to built-in furring strips via nailing fins.
- G. Window secured to framing via nailing fins.
- H. Spray foam between window & framing (creates air barrier connection).
- I. Nailing fins taped to polymer facer (creates air barrier connection).
- J. Head flashing installed above window.
- K. Tape flashing to polymer facer.

Typical construction shown. Please refer to design drawings specific to your application. Confirm/consult with design professional prior to installing Quik-Therm products.

It is recommended to use building paper between cementitious stucco and the 936 panel film.

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Fastening

Fasteners, Foam, Sealants and Tapes - Best Practices

Page 10 of 11 July 2021

- Framing nail heads to be flush with furring strip top surface. Do not drive nail heads into furring.
- Framing nails through 2¹/₂" thick 936 Connect to framing must achieve minimum 0.75" embedment into framing (Engineered by Morrison Hershfield).
- For typical vertical application/orientation's. Space nails 8" apart along furring strips.
- Horizontal applications (furring perpendicular to studs). 2 nails per furring strip into each framing member @16" O.C.
- Use multiple fasteners at plates and rim joists (see Installation Renders).
- Commonly used 936 cladding materials. Cementious Stucco (vertical orientation only), Cement Board, Metal, Wood, Composite, etc.
- Consult with a Design Professional.

Canned Spray Foam

- Foam together tongue and groove and butt foam to foam connections. Spray foam must be compatible with expanded polystyrene (EPS) rigid foam.
- Use spray foam to fill cracks and gaps between rigid foam and rigid foam and wood and around windows, doors, etc.
- DO NOT use spray foam to create an air barrier connection to polymer facers. It DOESN'T create a structural bond.
- DO NOT use spray foam in lieu of the poly foam gaskets or air barrier sealants.
- For additional spray foam applications consult with a Design Professional.

<u>Air Barrier Sealants</u>

- To complete an air barrier gasket connection, a 1/4" continuous bead of liquid applied air barrier sealant can be used to seal 3/16" poly foam gasket. The poly gasket and sealants are interchangeable.
- Air Barrier sealants must be compatible with the 936 polymer facers and rigid EPS foam. Recommendations: LePage Quad Max or Henry Air Bloc, or specified by a Design Professional.
- Liquid applied air barrier sealants can be used to seal window and door nailing fins, etc. to 936 polymer facers. See Installation Guidelines. Refer to Sealant Manufacturer's recommendations.
- Air barrier sealants are not recommended for foam to foam and wide/large gap connections. Use spray foam to fill large gaps.

<u>Tapes</u>

- Tape all 936 polymer faced tongue and groove and butt joint connections. Recommended Tape: 50500 Cantech Flashing Tape, or other tape specified by a Design Professional.
- Tape 936 polymer faced panels to wood, PVC, Fiberglass and metal window and door nailing fins.
- Use minimum 4" wide tape for T&G connections, and vertical sides and bottom of windows and doors.
- Use minimum 6" wide flashing tape for butt foam connections and along top of windows and doors.

Rim Joists

Recommendation: For best air barrier performance 936 Connect should terminate below the rim joist/foundation connection. Using 3/16" poly foam gasket or air barrier sealants create an air barrier seal/gasket between 936 Connect and the foundation or seal the rim joist/foundation connection as specified by a Design Professional.

Sealing Electrical Boxes

Seal all exterior wall electrical boxes and other breaches using conventional code compliant techniques. Apply tapes and sealants to the 936 Connect polymer film in the same manner as 6 mil polyethylene. Optional: Pressure sealed hard plastic electrical boxes with foam gaskets.

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QUIK-THERM"	Instal	llation Guide 936 Connect	Section 4 30 yr Transferable Warranty	
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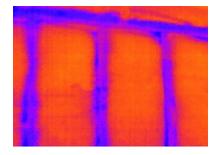
Page 11 of 11 July 2021

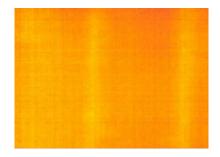
30 Year Transferable Warranty

Quik-Therm Insulation Solutions Inc. (QT) is committed to the superior design, performance and value of the Composite 936 Connect Wall Weatherization System (936). Due to our extreme confidence in 936 Connect and our desire to deliver the highest performing above grade wall weatherization insulation technology, QT has created a consumer-friendly 30 Year Transferrable Warranty.

Infrared Thermography IR is a commonly used technology to detect temperature, moisture and air leakage in wall assemblies. During winter heating, distinct darker colors indicate colder building materials, air leakage and potential moisture. Warmer, dry areas are illustrated by lighter, softer colors.

IR imaging from inside a building during a sustained heating period (winter)





Conventional 2x6 wall with R-20 fiber batt insulation

936 Connect 2x4 Wall Weatherization System

During a sustained heating period (winter), Quik-Therm guarantees that 936 Connect IR images will appear similar to the 936 Connect wall render. Should IR imaging indicate 936 appears similar to the 2x6 conventional R-20 batt wall render, QT will repair and/or replace the affected wall at no charge to the builder or building owner. Learn more about the 936 Connect warranty at quiktherm.com.

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