SECTION 074813
THERMALLY BROKEN RAIN SCREEN ATTACHMENT SYSTEM

SPEC NOTE: This performance guide specification is intended for use when specifying a thermally broken panel/siding support/attachment framing to provide ASHRAE 90.1 compliant U-value rain screen wall assemblies.

DISCLAIMER: The manufacturer has reviewed the product information contained in this guide specification. The information is organized and presented to assist the specification writer working on a construction project to select the appropriate products and to save time in writing the project specification Section. The specification writer is responsible for product selection as well as the use and application of this information, and should contact the manufacturer to ensure that all options are available and that the associated specification information is valid and correct.

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Written around Knight Wall Systems MFI-System S-Series, thermally isolated, cold-formed framing system, vertically oriented.

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This specification is written with vertical rails attaching directly to intermittent thermally isolated wall brackets and also has an optional horizontal member that attaches to the vertical rail.

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The bracket and rail connection of this specification is fixed with only slight adjustability (1/8 inch) and has the ability of adding specially designed shims between the thermal isolator and sheathing at 1/8 inch increments. These do not increase the thermal transmittance and fits square, straight and bears evenly for a structurally secure and sound connection. This system creates a 0.75 inch air cavity behind the cladding when only the vertical rail is used and 1.5 inch air cavity when the vertical + horizontal rail is used (measured from the backside of the cladding to the face of the insulation).

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Minimum cavity size (from substrate to back of cladding):

2" bracket + vertical only member = 2.75 inches

2" bracket + vertical + horizontal members = 3.5 inches

Maximum cavity size (from substrate to back of cladding):

6" bracket + vertical only member = 6.75 inches

6" bracket + vertical + horizontal members = 7.5 inches

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Items in highlighted brackets [ ] are either optional or require project specific input by specifier

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Engineered, tested, thermally-broken, cold-formed metal rain screen framing assembly at exterior cavity walls.

B. Related Requirements:

1. Section 033000 - Cast-In-Place Concrete
2. Section 042200 - Concrete Unit Masonry
3. [Section 044200 - Exterior Stone Cladding]

4. Section 072114 - Semi-Rigid Mineral Wool Insulation
5. Section 072726 - Fluid-Applied Membrane Air-Vapor Barriers
6. [Section 076000 - Flashing and Sheet Metal]
7. [Section 079200 - Joint Sealants]
8. [Section 074200 - Exterior Finish Wall Panels]
9. [Section 074213 - Metal Wall Panels]
10. [Section 092400 - Portland Cement Plastering (Stucco)]

1.2 REFERENCES

A. Reference Standards: Conform to provision of Section 014219.

B. ASTM International (ASTM): http://www.astm.org

1. ASTM A1046 - Standard Specification for Steel Sheet, 55% Zinc-Aluminum Magnesium Alloy-Coated by the Hot-Dip Process.
2. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM E8 - Standard Test Method for Tension Testing of Metallic Materials.

C. American Architectural Manufacturers Association (AAMA):

1. TIR-A8 - Structural Performance of Composite Thermal Barrier Framing Systems – Section 7.2

D. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

1. 90.1-2010 - Energy Standard for Buildings except Low-Rise Residential Buildings.

E. American Iron and Steel Institute (AISI):

1. Code of Standard Practice

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Conform to Section 013113 for coordination with work of related Sections.

1. Sections 033000 and 042200 for connections to concrete and masonry wall construction.
2. Sections 044200, 074213, and 092400 for support of [stone cladding,] metal wall panels, and Portland cement plaster systems.
3. Section 072114 for mineral wool insulation criteria specified by that Section [for installation into work of this Section.]
4. Section 072726 for fluid-applied air barrier system installation with penetration fasteners to maintain integrity of air barrier system.

B. Pre-installation Meeting: Preinstallation Meeting: Arrange in conformance to requirements of Section 013119.

1. Attendance: Contractor, installer, Owner, Architect, manufacturer's engineer providing curtain wall systems design, manufacturer's technical representative, and those representing related work requested to attend.
2. Meeting Time: Minimum [2] [3] [4] weeks prior to prior to beginning work of this Section and work of related Sections affecting work of this Section.
3. Location: Project Site.

C. Sequencing and Scheduling: Conform to Section 013216 to meet Construction Progress Schedule for Critical Path and scheduling for long lead items and to avoid delaying work.

1.4 SUBMITTALS

A. Conform to submittal requirements of Section 013300.

B. Product Data: Submit manufacturer's product data, installation instructions and Material Safety Data Sheets (MSDS) for each component product required for complete wall system. Submit manufacturer's product literature and descriptions of testing performed on system components to indicate that they will meet or exceed performance specified herein.

C. Shop Drawings: Submit shop drawings from Panel manufacturer, showing interface of cold-formed assembly and panels with adjacent construction, signed and sealed by engineer licensed to practice in authority having jurisdiction, detailing system installation and attachment.

D. Structural Calculations:

1. Submit façade attachment/support framing system manufacturer's comprehensive analysis of design loads, including dead loads, live loads and wind loads, signed and sealed by an engineer licensed to practice in the authority having jurisdiction detailing system attachment and installation.

E. Samples: Two each of components and fasteners for system assembly.

F. Test Data: Independent test results or engineered analysis for performance signed by independent agency representative.

G. Manufacturer's Instructions: Include installation instructions, clearances, special procedures, and conditions requiring special attention.

H. Good Standing: Written and signed by manufacturer's agent indicating installer as in good standing and approved to erect work of this Section.

I. Sample Warranty: Meet or exceed provisions specified by this Section.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Able to document minimum 5 years experience designing and supplying work of this Section.
2. Maintain locally available technical product representation available to meet at project site as needed for meetings and inspections of work.

B. Installer Qualifications:

1. Trained and authorized by manufacturer as qualified to install work of this Section.
2. Employ full-time on-site superintendent or foreman to overseeing installation during work of this Section.
3. Able to show successfully completed projects of equivalent scope and quality upon request by Architect.

C. Mock-Ups: Provide under Quality Assurance provisions of Section 014300.

1. Mock up complete system at location as directed by Architect.
2. Provide as required to illustrate substrate, air barrier, insulation, framing, flashing, thermal isolation, and treatments at fenestrations, corners, and transitions.
3. Verify mock-up as conforming to manufacturer's instructions and provisions of Contract Documents.
4. Do not begin work of this Section until after inspection by manufacturer's representative is complete and mock-up has been accepted in writing by Architect.
5. Protect and maintain accepted mock-up as standard of quality for work of this Section.
6. Accepted mock-ups may be incorporated into the work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Conform to provisions of Section 016510 and manufacturers instructions.

B. Ordering: Conform to manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Store and handle to keep clean, dry, and protected from damage due to weather and construction activities.

1.7 FIELD CONDITIONS

A. Site Environmental Requirements: Do not install materials until site conditions conform to manufacturer instructions.

1.8 WARRANTY

A. Conform to Warranty requirements specified by Section 017836.

B. Manufacturer Warranties: Attachment/Support Framing System: Limited warranty

1. Length: Written ten (10) years.
2. Covers components of the attachment system, including structural failure of components when all the materials and component are supplied and installed per manufactures requirements.
3. Includes labor and material for removal and replacement of defective material.
4. Includes labor to remove and reinstall façade finish panels, finish closures and façade finish accessories necessary to access defective material.

C. Contractor's Warranties: 2-year labor warranty, starting from [date of Owner acceptance of completed work][Substantial Completion], to cover repair of materials found to be defective as a result of installation errors.

D. Limitation of Warranties: Exclude repairs, replacement, and corrective work to the substrate, primary structure, finish panels, and/or property – unless otherwise noted above. Warranties exclude mechanical damage due to abuse, neglect, primary structure failure, or forces of nature greater than normal weather conditions.

1.9 SOURCE QUALITY CONTROL

A. Single Source Responsibility: Furnish engineered design and fabrication by or under direct responsibility of single manufacturer.

B. Field Measurements:

1. Verify conditions prior to preparing shop drawings and beginning fabrications.
2. Where this is not practical, verify with dimensions shown on shop drawings and mark corrections prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Recommended Product: Knight Wall Systems, MFI-System S-Series Rain Screen System, thermally insulated and isolated between metal components and substrate.

1. Tel (509) 262-0104, Email brian@knightwallsystems.com (Brian Nelson)
2. Tel (509) 262-0104, Email info@knightwallsystems.com / sales@knightwallsystems.com
3. Web Site http://www.knightwallsystems.com

B. Or approved equal.

C. Substitution Requests: Conform to provisions of Section 012500.

2.2 REGULATORY REQUIREMENTS

A. Conform to regulatory requirements specified by Section 014100.

B. Design and Structural Properties: Conform to provisions of 2009 International Building Code (IBC) including IBC Section 1604.3.3 and IBC-2009 Section 2210 including applicable referenced AISI specifications and standards.

2.3 PERFORMANCE / DESIGN CRITERIA

A. Structural Design: Provide engineered design capable of withstanding combined effects of stresses from dead loads, wind loads, normal thermal movement, and other anticipated stresses without evidence of permanent defects or failure.

1. Wind Load: Uniform pressure (velocity pressure) of (Insert Design Criteria) lb/sq ft. (Insert Design Criteria), acting inward or outward.
2. Dead Loads: Design for loading to accommodate support of cladding systems specified by related sections and shown on Drawings and as required by (applicable building code) (_____).
3. Seismic Loads: Design and size components to withstand seismic loads and sway displacement.

B. Thermal Expansion and Contraction: Design for movement due to cyclic day and night temperatures to not exceed safety factors for fasteners, joints, seals, and components.

C. Cladding Accommodation: Design framing supports configuration, size, spacing, and make adjustments as needed to accommodate support for each cladding type, including:

1. Panels specified by Section [074200].
2. Acrylic Plastering specified by Section [092513].

D. Rain Screen Design: Design ventilating system assembly to accommodate movement of air movement into the rain screen cavity and move water vapor out.

E. Tolerances:

1. Accommodate deflection of structural members.
2. Maintain clearances at adjacent construction.
3. Prevent load transfer to non-structural elements.

F. Thermal Barriers:

1. Thermally isolate metal components from each other and support wall.
    a. Maximum contact area between isolator and sheathing: 3.15 square inches
    b. Maximum thickness: 0.375 inches
    c. Shims that may be used for plumb and true alignments must not increase thermal isolation contact area.
2. Thermally isolate fasteners from metal using thermal isolation washers or other means.
    a. Minimum thickness: 0.125 inches

G. Thermal Insulation: As specified by Section 072113.

1. Design thickness and type of insulation into system assembly.
2. Perform thermal analysis to determine framing systems effect on wall assembly.

H. Effect on Wall Assemblies Thermal Resistance: Framing system must not degrade complete wall assemblies thermal resistance by more than 17% and conform to ASHRAE 90.1 prescriptive U-value of wall assembly for appropriate climate zone.

1. Three dimensional computer simulated thermal analysis or guarded hot-box test (ASTM C1363-11) results required.

2.4 THERMALLY BROKEN RAIN SCREEN COMPONENTS:

A. Gauge, Configuration, Dimensions, and Spacing: Minimum 18 gauge and as needed to conform to design criteria for each assembly.

B. Material: ASTM A1046, Commercial Steel (CS), Grade B, 50 ksi Yield, Coating Designation ZM40 min.

C. Wall Brackets:

1. Minimum 0.074 inch thick (14 gauge) sheet steel.
2. Pre-Punched Holes: For minimum two wall anchors per bracket.
3. Stem for Connecting Rail to Bracket: Must not penetrate exterior layer of insulation.

a. Dimensions: 1.125 inch wide by 0.625 inch long
b. Pilot Drill Holes: For easy engagement and placement of stainless steel self-tapping hex-head screws for use in attaching vertical rail.

4. Dimensions: As needed to offset cladding from wall plane where meeting substrate and to allow for installation of insulation equal in thickness to offset.

a. Bracket Base Dimension – Minimum 3.25 inch high and 2.125 inch wide
b. Offset Brackets – 2, 3, 3.5, 4, 5 or 6 inch depth.

1) Align offsets to differing wall planes as shown on Drawings.

5. Recommended Product: ThermaBracket-S by Knight Wall Systems or approved equivalent

D. Vertical Rail: Minimum 0.046-inch thick (18 gauge) cold-formed steel.

1. Profile: C channel, two flanges of equal length and one web.
2. Nominal Dimensions: 1.0 inch flange for attaching to wall bracket and 1.5 inch at web.
3. Pre-Punched Attachment Holes: 1.0 inch on center along length of track and oversized allowing for thermal contraction and expansion of rail without placing stress on brackets.
4. Recommended Product: S-Rail by Knight Wall Systems or approved equivalent

SPEC NOTE: Horizontal rails (E) may not be necessary. This is dependent upon the panel type, its orientation and/or configuration. Please contact Knight Wall Systems if there is any uncertainty or questions.

E. Horizontal Rail: Nominal 0.046 inch thick (18 gauge) cold-formed steel.

1. Profile: C channel with lips, symmetrical, two flanges of equal length with stiffening lips and one web.
2. Dimensions: [2.0 or 3.0 or 4.0 or 5.0] inches at web, 0.75 inch at flanges with stiffening lips.
3. Weep Drains: 0.75 inches diameter at 4 inches on center along flanges to allow for drainage.
4. Attachment Holes: Locate at 2 inch on center along back to facilitate number 14 self-drilling self-tapping screw attachment to vertical rail.

a. Oversize holes to allow for thermal contraction and expansion of rail.

5. Recommended Product: PanelRail by Knight Wall Systems or approved equivalent

2.5 RAIN SCREEN COMPONENTS THERMAL ISOLATION:

1. Material: Injection molded Polyoxymethylene copolymer (POM) non-fiber reinforced
2. Tensile Strength: 9.5 ksi per ISO 527
3. Melting Temperature: 329 degrees Fahrenheit per ISO 3146
4. Size:

a. Washer Isolation: Designed to thermally isolate fastener heads from metal, minimum 0.125 inch thick
b. Framing member to framing member isolation: minimum 0.125 inch thick

c. Support wall substrate isolation: minimum 0.375 inch thick at each wall bracket.
d. Bracket shim: must match support wall substrate isolator profile, available in 0.125 inch thickness and does not decrease thermal or structural performance of system.

5. Recommended Product: ThermaStop™ Isolators by Knight Wall Systems or approved equivalent

2.6 CONNECTORS AND ANCHORS

1. All wall anchor fasteners to be of sufficient length to provide solid attachment through rigid insulation to structure as required by manufacture.
2. For steel stud framing substrate: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.
   a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.
   b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds
3. For concrete and concrete masonry units substrate:
   a. Embedment depth: 1.25 inches minimum
   b. Minimum ultimate pull-out capacity from substrate material: 450 pounds
   c. 1/4 inch Tapcon by Buildex
   d. 1/4 inch UltraCon by Elco Industries
   e. Or approved equal.
4. For horizontal rail to vertical rail connection: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.
   a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.
   b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds

2.7 ACCESSORIES

A. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness as necessary to meet structural requirements for special conditions encountered.

B. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify conditions ready to receive work of this Section before beginning.

B. Backup Wall: Verify level and plumb, free of defects, and conforming to tolerances suitable for installation of subsequent work.

C. Air / Water Barrier: Verify complete, cured, and conforming to manufacturer’s instructions. Verify fenestrations, transitions, discontinuities, and sills and ledgers flashed and sealed to move moisture to exterior of building as part of air barrier system.

3.2 PREPARATION

A. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

B. Shim and perform work as necessary for plumb and true alignments.

3.3 INSTALLATION

A. Conform to manufacturer's instructions and provisions of Contract Documents.

B. Erect cold-formed rain screen assembly to be level, plumb, and in alignment with building features including corners, off-sets, and fenestrations.

C. Wall Brackets and Vertical Rail:

1. Mount wall brackets at 16 [24] inch on center horizontally on support wall (at each stud location), using self-drilling self-tapping screws at metal stud framed walls and expansion or adhesive anchors at concrete and masonry walls.

    a. Brackets must be laid out at an even 0.5 inch increment vertically or horizontally.
    b. Tighten snug tight and as instructed by fastener manufacturer instructions.
    c. Where using snug tight criteria, verify torque for each installer using hand tools at beginning of project.

2. Thermally isolate wall bracket attachments by sandwiching thermal break material between metal bracket and support wall substrate.
3. Thermally isolate screw fastener washers using material to thermally isolate fastener heads from metal bracket.
4. Attach vertical rail to wall bracket stem by use of a self-tapping screw fastener through the pre-punched holes in the rail and into the pre-punched pilot holes on the bracket.
5. Isolate vertical rail from bracket by sandwiching a thermal break material between rail and bracket stem.
6. Place shims the same size and profile as the isolator between the sheathing and bracket isolator to account for irregularities in support wall.
7. Establish and re-establish and restart vertical bracket locations using laser or chalk-line at fenestrations and other obstructions to establish horizontal alignments. Brackets must be placed at 0.5 inch increments vertically or horizontally.

D. Horizontal Rail:

1. Space to make suitable bearing surfaces for each cladding system as instructed by manufacturer and as shown on Architect accepted shop drawings.
2. Begin at bottom and mount to vertical rails using No. 14 self-drilling self-tapping stainless steel screws.
3. Tighten screws to snug tight. Verify equivalent snug tight condition for installers using hand tools.
4. Install successive horizontal rails as required for panel type.
5. When encountering fenestrations and other openings, mount horizontal rails so that fastening points are as close to the lower and upper edges as possible.

E. Semi-Rigid Mineral Wool Insulation: Install to expand into and tightly fit between wall brackets to make continuous, unbroken insulated face of wall as specified by Section 072114.

F. Touch-up shop-applied protective coatings damaged during handling and installation.

G. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws are not recommended, as the sparks produced during cutting will damage the anti-corrosion coating. If saws are used, surrounded metal coating MUST be protected from sparks.

H. Minimum length of installed cut vertical rail is 12” and must be mechanically attached to at least two separate wall brackets.

I. Minimum length of installed cut horizontal rail is 12” and must be attached to at least two separate vertical rails to prevent rotation of rail. Unsupported span of installed horizontal rail that extends past closest vertical rails must not exceed 7.5” in length. At opening jambs (i.e. windows, doors, etc) the horizontal rail must not extend past the vertical rail by more than 3” in length.

3.4 ERECTION TOLERANCES

A. Maximum Framing Member Variation from True Position: 1/4 inch.

B. Maximum Framing Member Variation from Plane:

1. Individual Framing Members: Do not exceed 1/4 inch in 10 foot.
2. Accumulative Over-all Variation for Wall and Floor System: Do not exceed 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Technical Service: Make intermittent and final inspection to verify installation in conformance to manufacturer instructions and suitable as framing assembly for subsequent metal panels, acrylic plastering, and other cladding installations.

1. Confirm snug tight and fastener sizing.
2. Confirm framing members installed in correct orientation.

3.6 ADJUSTING

A. Inspect and adjust after installation. Replace or repair defective work.

B. Adjust, and reconfigure as necessary to accommodate cladding systems for installations over work of this Section. Do not reuse pre-drilled holes unless fastener size is increased.

END OF SECTION