SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS.

3A Composites Inc.

ALUCOBOND PLUS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes MCM wall panels.

1.3 DEFINITIONS

A. DBVR: Drained and back-ventilated rainscreen system; rainscreen system designed to drain and dry cavity entering water through drainage channels, weeps, and air ventilation.

B. MCM: MCM; cladding material formed by joining two thin metal skins to polyethylene or fire-retardant core and bonded under precise temperature, pressure, and tension.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1. Meet with Owner, Architect, Owner's insurer if applicable, MCM panel Fabricator and Installer, MCM sheet manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects MCM panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect MCM panels.
5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
6. Review temporary protection requirements for MCM panel assembly during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of MCM panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of MCM panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. MCM Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other MCM panel accessories. Submit custom color samples in paint manufacturer's standard size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

1. MCM Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance to comparable code sections IBC 1407.14 and IBC 1703.5.
2. MCM System Fabricator's Certified System Tests Reports: Certified system test reports showing system compliance with specific performance or third-party listing documenting compliance code section. Base performance requirements on MCM system type provided.

a. Wet System: Tested to AAMA 501.
b. DBVR System: Tested to AAMA 509.
c. PER System: Tested to AAMA 508.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For MCM panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by MCM Fabricator.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for MCM fabrication and installation.

1. Build mockup of typical MCM panel assembly [**as shown on Drawings**] <**Insert size**>, including [**corner,**] [**soffits,**] supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of mockup of MCM panel assembly, testing for water penetration in accordance with AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.

B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack MCM panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on MCM panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate MCM panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Warranty on Panel Material: Manufacturer's standard form in which manufacturer agrees to replace MCM that fails within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: [**20**] [**10**] [**Five**] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide MCM panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: [**As indicated on Drawings**] <**Insert loads**>.
3. Panel Deflection Limit: For wind loads, no greater than [**1/60**] <**Insert deflection**> of the span
4. Framing Member Deflection Limits: For wind loads, no greater than [**1/175**] [**1/240**] or <**Insert deflection**> of the span.
5. <**Insert serviceability requirements**>.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested in accordance with ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes.

1. Temperature Change (Range): minus 20 deg F to 180 deg F (minus 29 to 82.2 deg C), material surfaces.

E. Fire Propagation Characteristics: MCM wall assembly passes NFPA 285 testing.

2.2 MCM WALL PANELS <**Insert drawing designation**>

A. MCM Wall Panel Systems: Provide factory-formed and -assembled, MCM wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components[**, panel stiffeners**], and accessories required for weathertight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® PLUS or comparable product by:
   a. <**Insert manufacturer's name**>.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, [**coil-coated**] [**anodized**] aluminum sheet facings.

1. Panel Thickness: [**0.157 inch (4 mm)**].
2. Core: [**Fire retardant**].
3. Exterior Finish: [**PVDF fluoropolymer**] [**FEVE fluoropolymer**] [**Siliconized polyester**] [**Clear anodized**] [**Color anodized**].
   a. Color: [**As indicated by manufacturer's designations**] [**As selected by Architect from manufacturer's full range**] [**As indicated on drawing schedule**].
      1) Color 1: <**Insert color**>.
      2) Color 2: <**Insert color**>.
      3) Color 3: <**Insert color**>.
      4) Color 4: <**Insert color**>.
4. Peel Strength: 22.5 in-lb/in. (100 N x mm/mm) when tested for bond integrity in accordance with ASTM D1781.
5. Fire Performance: Flame spread less than 25 and smoke developed less than 450, in accordance with ASTM E84.

C. Attachment Assembly Components: Formed from [**extruded aluminum**] [**material compatible with panel facing**].

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of MCM panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® Axcent™ Trim or comparable product by one of the following:

   a. Arconic Architectural Products (USA).
   b. Mitsubishi Chemical Composites.
   c. <**Insert manufacturer's name**>.

2. Aluminum Trim: Formed with 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet facings.
3. Color: [**As indicated by manufacturer's designations**] [**As selected by Architect from manufacturer's full range**] [**As indicated on drawing schedule**].

   a. Color 1: <**Insert color**>.
   b. Color 2: <**Insert color**>.
   c. Color 3: <**Insert color**>.
   d. Color 4: <**Insert color**>.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish MCM panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate MCM panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. PVDF Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. FEVE Fluoropolymer: AAMA 2605. One-coat [**clear**] [**tinted**] fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
4. Exposed Anodized Finish:

    a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
    b. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating MCM panels to verify actual locations of penetrations relative to seam locations of MCM panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and MCM panel manufacturer's written recommendations.

3.3 MCM PANEL INSTALLATION

A. General: Install MCM panels in accordance with Fabricator's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor MCM panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving MCM panels.
2. Flash and seal MCM panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by MCM panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as MCM panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by MCM panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support MCM wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Panel Installation: Attach MCM wall panels to supports at locations, spacings, and with fasteners recommended by Fabricator to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent MCM wall panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."

a. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended in writing by Fabricator. Attach routed-and-returned flanges of wall panels to panel clips with Fabricator's standard fasteners.
b. Panel Installation:

1) Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."
2) Seal horizontal and vertical joints between adjacent MCM wall panels with Fabricator's standard gaskets.
3) Joint Sealing: Seal all joints in accordance with AAMA 501.

2. PER Installation: Install using Fabricator's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach MCM wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

a. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by Fabricator. Use Fabricator's standard horizontal tracks and vertical [**tracks**] [**drain channels**] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach MCM wall panels to tracks by interlocking panel edges with Fabricator's standard "T" clips.
b. Panel Installation:
1) Attach routed-and-returned flanges of wall panels to perimeter extrusions with Fabricator's standard fasteners.
2) Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.

c. Joint Sealing: Seal all joints in accordance with AAMA 508. Do not apply sealants to joints unless indicated.

3. DBVR System: Install using Fabricator's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by Fabricator. Attach MCM wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
   a. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use Fabricator's standard horizontal tracks and vertical [**tracks**] [**drain channels**] that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach MCM wall panels to tracks by interlocking panel edges with Fabricator's standard "T" clips.
   b. Panel Installation:
      1) Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
      2) Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
   c. Joint Sealing: Seal all joints in accordance with AAMA 509. Do not apply sealants to joints unless otherwise indicated.
4. Face Fastened System:. Attach MCM wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
   a. Space, locate, align, and fasten subgirt hat channel framing over gypsum sheathing after application of air barrier specified by Section 07 25 00.
   b. Install fasteners in lengths and locations required in order to penetrate hat channels and structural metal wall framing in accordance with fastener manufacturers’ instructions.
   c. Torque screws as necessary for a snug fit. Do not over-torque; prevent ‘oil canning’ of panels.
   d. Install wall panels to allow individual panels expand and contract and be installed and removed without disturbing adjacent panels.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete MCM panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by MCM panel Fabricator; or, if not indicated, provide types recommended in writing by MCM system Fabricator.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, or SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Site Verifications of Conditions:

1. Verify conditions of substrate previously installed under other Sections are acceptable for the MCM system installation. Provide documentation indicating detrimental conditions to the MCM system performance.
2. Once conditions are verified, MCM system installation tolerances are as follows:

    a. Shim and align MCM wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly [**shown on Drawings**] [**as directed by Architect**] <**Insert area**> for water penetration in accordance with AAMA 501.2.

B. Fabricator's Field Service: Engage a factory-authorized service representative to test and inspect completed MCM wall panel installation, including accessories.

C. MCM wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as MCM panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of MCM panel installation, clean finished surfaces as recommended by MCM panel manufacturer. Maintain in a clean condition during construction.

B. After MCM panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace MCM panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23

SECTION 07 48 00

RAINSCREEN ATTACHMENT SYSTEM

This section includes editing notes to assist the user in editing the section to suit project requirements. These notes are included as hidden text, and can be revealed or hidden by the following method in Microsoft Word:

Display the FILE tab on the ribbon, click OPTIONS, then DISPLAY. Select of deselect HIDDEN TEXT.

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. Provide a thermally broken, rainscreen attachment system to sufficiently support cladding installed over exterior insulation while maintaining visual design concepts.

B. Design Requirements:

1. Employ qualified professional engineer licensed in State of [____] to perform structural design.
2. Design furring system to withstand live and dead loads in accordance with [Building Code.] [Structural General Notes on Structural Drawings.] [_____.]
3. Minimum stud gauge of back-up wall assembly to be 43 [54] mil thickness.
4. Continuous, solid, non-perforated framing profiles (including C- or Z-shaped sections or furring) penetrating insulation are not allowed.
5. Attachment system must have proven thermal isolation with a reduction in thermal bridging as indicated by calculations or finite element analysis in accordance with ASHRAE guidelines.
6. Fasteners: tension shall be taken as the sum of direct tension plus tension due to prying for eccentrically loaded connections. Prying may be reduced or eliminated if proven via engineering analysis or testing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
1. Attendance: [Architect,] [Owner,] [Construction Manager,] [Design/Builder,] Contractor, installer, and related trades.
2. Review: Project conditions, back-up wall framing, manufacturer requirements, delivery and storage, staging and sequencing, and protection of completed work.

1.3 SUBMITTALS

A. Action Submittals:
1. Drawings: Illustrate products, installation, spacing and connection to adjacent construction.
2. Product Data: Manufacturer’s descriptive data and product attributes.
3. Samples: [Selection samples.] [Verification samples.]

B. Informational Submittals:
1. Structural calculations: Manufacturer's comprehensive structural design analysis signed and sealed by a registered professional engineer.
2. Three-dimensional thermal modeling indicating framing system’s impact on exterior insulation rated R-value.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Firm specializing in work of this Section, with minimum [3] [__] years’ documented experience.

B. Mock-Ups: Coordinate mock-up materials and requirements with mock-up specified in Division 01 [and exterior cladding specification].

C. Single source responsibility: Furnish engineered rainscreen attachment system components under direct responsibility of single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturers' original, unopened and undamaged containers or crates. Keep materials clean, dry and free of dirt and other debris and protect from weather or construction activities. Follow manufacturers' recommendations.

1.6 WARRANTY

A. Manufacturer's 10-year limited warranty against structural failure of system; includes the labor and material cost for removal and replacement of defective material; includes the labor cost for removal and reinstallation of overlying façade finish panels as required to access defective materials. All materials and components to be supplied and installed per manufacturer's requirements. Excludes repairs, replacement, and corrective work to the substrate, primary structure, finish panels, and/or property – unless otherwise noted above.

B. Installer's 2-year warranty against defects in installation of system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Knight Wall Systems. www.knightwallsystems.com

B. Substitutions: [Refer to Division 01.] [Not permitted.]

2.2 MATERIALS

A. Steel Sheet:
1. Steel classification: Structural steel, 50 ksi yield strength.
2. Corrosion protection coating: ASTM A1046, zinc-aluminum-magnesium, minimum thickness ZM40.

2.3 COMPONENTS

A. Comply with ANSI/ASHRAE 90.1.

B. Primary [Horizontal] [Vertical] Girts:
1. Profile: ThermaZee; z-channel, front and back flanges of equal length, with attachment holes.
2. Thickness: Minimum [18] [16] gage.
3. Web perforations: Minimum 50 percent open area.
4. Depth: [[1.5] [2] [2.5] [3] [3.5] [4] [4.5] inches.] [As indicated.]
5. Thermal isolation:
   a. Located between back flange and substrate; continuous along length of channel
   b. Minimum 0.25 inch thickness.
   c. Thermal conductivity: Less than 0.18 Watts per Meter Kelvin.
   d. Designed to prevent accumulation of liquid water on upper edge.
6. Finish: [Mill.] [Black PVDF coated.]

C. Secondary [Vertical] [Horizontal] Rails:
1. Profile: PanelRail; square hat channel with stiffening lips, weep drains and attachment holes.
2. Thickness: Minimum [18] [16] gage.
3. Web perforations: 3/4 inch diameter holes at maximum 4 inches on center.
4. Fastening face width: [[2] [3] [4] [5] inches.] [As determined by structural analysis.]
5. Depth: 3/4 inch.
6. Finish: [Mill.] [Black PVDF coated.]

D. Secondary Vertical Joint Rail:
   1. Profile: RevealRail; square hat channel with stiffening lips.
   2. Thickness: Minimum [18] [16] gage.
   3. Dimensions: 2.0 inches at web, 1.625 inches at each flange, with 0.25 stiffening lips.
   4. Depth: 3/4 inch.
   5. Finish: [Mill.] [Black PVDF coated.]

2.4 ACCESSORIES

A. Thermal Insulation: Refer to Section [__ __ __ - _____].

B. [Siding] [Cladding] Panels: Refer to Section [__ __ __ - _____].

C. Wall Anchors: Corrosion resistant coated steel; thermally isolated with minimum 1/8 inch thick polymer washer; type, spacing and embedment as system engineer requires.

D. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness to meet structural requirements.

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

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved engineering calculations.

B. Place girts no greater than maximum spacings indicated.

   1. Girt layout may need to be coordinated with cladding layout and fastening requirements.
   2. Components must not be cut while installed on the building unless a shearing instrument is used.

C. Friction fit thermal insulation tight to girts.

D. Install [siding] [cladding] as specified in Section [__ __ __ - _____].

3.2 ADJUSTING

A. Clean and touch up damaged coatings.

END OF SECTION

Generated by ABTG Steel Frame Wall Calculator

Wall Compliance Certificate

www.appliedbuildingtech.com/fsc/steelcalculator

Project _____

Building/Energy Code	**2015 IBC + IECC-C (Exc. group R)**
Construction Type	**Steel Frame Wall (R19+15ci)**
Climate Zone	**5**
Date	**8/16/2023**

Energy Code Compliance: Passes

Maximum U-Factor:	**0.064**	Your U-Factor:	**0.042**	Compliance:	**34.4% Better Than Code**
Minimum R-Value:	**R13+7.5ci**	Your R-Value:	**R19+15ci**	Compliance:	**Meets or Exceeds Code**

The % Better or Worse Than Code Index reflects how your wall compares to the prescriptive maximum U-factor required by code. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code wall.

Interior Vapor Retarder Compliance Options

Class I: Passes	Class II: Passes	Class III: Passes	None: Fails

Specifying the highest class of interior water vapor retarder that passes will maximize drying potential to the interior. Where a Class I or II vapor retarder is used in conjunction with continuous insulation, it must be a "smart" vapor retarder to maintain inward drying potential (e.g., Kraft facer on batt insulation is a "smart" Class II vapor retarder); otherwise, it is still highly recommended. Where "No Interior VR" is used in Climate Zones 4-8 for maximum inward drying potential, the wall must have a vapor control layer (less than 1 perm) on the exterior side of the wall and located to the interior side of the exterior continuous insulation; foam sheathing satisfies this requirement where its installed thickness or a facer on the interior side provides vapor permeance of less than 1 perm.

Wall Assembly

Exterior Air Film	**R-0.17**
Cladding	**MCM system (R-0.00)**
Exterior Continuous Insulation	**Rated R-value of insulation: R-15**
Exterior Sheathing	**Gypsum 1/2" (R-0.45)**
Cavity Insulation	**Rated R-value of insulation: R-19**
Framing	**6" Steel Stud at 16" o.c.**
Interior Finish	**Gypsum 1/2" (R-0.45)**
Interior Air Film	**R-0.68**
Assembly u-factor	**0.042**

Compliance Statement: The proposed wall design described here is consistent with the building plans and specifications submitted with the permit application. The proposed wall has been designed to meet the intent of the 2015 IBC + IECC-C (Exc. group R) code requirements.

Name/Title _____ Signature _____ Date _____

Project Notes

Building Code Compliance for Wall Assembly Thermal and Water Vapor Control - Calculator Output

The conclusions of this report were reached using the steel wall calculator created by the Applied Building Technology group and available at www.appliedbuildingtech.com/fsc/steelcalculator. The steel wall calculator is a tool to help coordinate energy code thermal insulation compliance and building code water vapor control compliance for a proposed steel frame wall assembly on a commercial or residential building. It performs the following two design checks for a user inputted wall assembly:

- Computes the assembly U-factor and compares it to code minimum thermal performance requirements (maximum U-factors) found in the 2012, 2015, 2018 and 2021 versions of the IECC and the 2016 and 2019 versions of ASHRAE 90.1 which are climate dependent. The U-factor calculation is based on the "cavity correction factor method" in accordance with 2015/2018 IECC Table C402.1.4.1 (ASHRAE 90.1 Appendix A Table A9.2B). The modified zone and series-parallel path methods are not used due to uncertainties in those methods that can introduce biased U-factor estimates for certain wall configurations. An R-value of 0.17 and 0.68 are assumed for exterior and interior air films, respectively. The calculator may also be used to investigate the effects of different materials on a wall assembly that otherwise complies with the prescriptive wall insulation component R-values for steel-framed walls found in IECC Table C402.1.3 or IECC Table R402.1.2 (IRC Table N1102.1.2) in combination with IECC Table R402.2.6 (IRC Table N1102.2.6).
- Conducts a water vapor control check as an aid to help determine if the proposed wall assembly also complies with minimum building code requirements associated with various interior vapor retarder options which are dependent on climate and other factors such as insulation amount and location. To supplement building code requirements and make them more complete, the check also integrates building science recommendations or best practices to control water vapor by way of properly using cavity and exterior continuous insulation materials to control water vapor (i.e. minimum insulation ratios). These practices also vary by climate. The moisture control check is based on ABTG Research Report No. 1701-01, which implements findings and recommendations from a comprehensive review and analysis of multiple sources of scientific data, building code requirements, and experience. The technical basis of this calculator (ABTG Research Report No. 1410-03) was used to support the development of recent updates to vapor retarder provisions for the upcoming 2021 editions of the IBC and IRC which will include only an abbreviated set of prescriptive solutions. This calculator provides flexibility to evaluate a broader array of code-compliant wall assembly solutions. There are several conditions, however, where this calculator and its technical basis depart in a conservative fashion from the 2021 IBC and IRC vapor retarder provisions, which are fully documented here.

The user is encouraged to confirm the suitability of this tool for the intended application, verify all outputs and recommendations, and seek professional advice as determined necessary.

Additional Moisture Control Considerations

Inward Moisture Movement from Reservoir Claddings

RECOMMENDATIONS: In moist climates (e.g., climate zones identified as "A/Moist" or "C/Marine"), use one of the following options:

- a non-reservoir cladding (e.g., vinyl siding, aluminum or steel siding, etc.)
- a reservoir cladding that is drained or back-vented (e.g., brick with vented air-space, adhered veneer with drainage/vent layer, cement siding on furring, etc.)
- a WRB layer that has a water vapor permeance of not greater than 10 perm (ASTM E96 wet cup). Some wraps and many insulating sheathing materials meet this requirement. Alternatively, if insulating sheathing is present behind the reservoir cladding and not used as the WRB, a separate high perm (>10 perm) WRB material can be used.
- For additional design guidance and options, refer to ABTG Research Report No. 1701-01 and also Section 2510.6 of the 2021 IBC or Section R703.7.3 of the 2021 IRC which have been updated to implement some of the above concepts.
- Source: ABTG Research Report No. 1410-03

Balancing Wetting and Drying Potential

RECOMMENDATIONS: Limiting wetting potential is the primary means of protecting walls against water damage in wet, wind-driven rain climates. Increasing drying potential will not necessarily resolve wetting problems or eventual damage from poor WRB and flashing installations. In fact, too much drying potential can result in too much wetting potential at different times of the year (see Inward Moisture Movement recommendations above). In any moist or marine climate zone, and particularly in those with moderate-to-severe wind-driven rain, using all of the following practices is recommended:

- Provide a clear drainage path (drainage space) behind cladding (e.g., use a rainscreen cladding material or cladding installation method with furring.)
- Inspect all flashing and WRB continuity prior to concealment with cladding and consider conducting a water-hose spray test of the WRB and flashing prior to concealment.
- Use pan (sill or threshold) flashing at all unprotected window and door openings.
- Air-seal the interior perimeter of the rough opening gap around all window and door frames.

In addition to the above recommended measures to control wetting potential and in the interest of maintaining adequate inward drying potential, this calculator requires use of a "smart" vapor retarder materials where a Class I or Class II interior vapor retarder is permitted to be used in combination with continuous insulation complying with the moisture control check (insulation ratios) of this calculator. Otherwise, a Class III vapor retarder or "no interior vapor retarder" may be used in accordance with a design complying with this calculator. For additional information and guidance, refer to:

- ABTG Research Report No. 1701-01
- Window Installation in Walls with Foam Sheathing
- Window Installation Details for Effective Sealing Practice
- Window Sill Details for Effective Drainage of Water
- ABTG Research Report No. 1410-03
- HUD Durability by Design 2nd Edition
- ABTG Educational Program on Water Vapor Control Methods