SECTION 07 21 00 - CONTINUOUS INSULATION SPECIFICATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

A. Definitions:

1. Continuous Insulation (CI) is defined by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) as insulation that is uncompressed and continuous across all structural members without thermal bridges other than fasteners and service openings and is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

B. Section Includes:

1. Exterior installation and performance of CI rigid insulation panels.

C. Related Sections:

1. Division 03 – Concrete: Cast-In-Place Concrete
2. Division 05 – Metals: Cold-Formed Metal Framing
3. Division 06 – Wood, Plastics, and Composites: Sheathing
4. Division 07 – Thermal and Moisture Protection: Fluid-Applied Membrane Air Barriers
5. Division 07 – Aluminum Composite Material Panel System
6. Division 07 – Thermal and Moisture Protection: Sheet Metal Flashing and Trim
7. Division 08 – Openings: Aluminum Windows
8. Division 08 – Openings: Glazing
9. Division 08 – Openings: Glazed Aluminum Curtain Walls

1.03 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed have either been identified by the

International Building Code (IBC) or local building code or are specific requirements for this building construction type.

B. International Energy Conservation Code (IECC)

C. National Fire Protection Association (NFPA):

1. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.04 DESCRIPTION

A. Performance Requirements:

1. Provide installed CI rigid insulation panels designed to withstand project-specific design loads while maintaining Deflection and Thermal Movement and Fire Performance without defects, damage, or failure as defined by the Manufacturer and required by this section. Fasteners must satisfy the thermal bridge requirements of ASHRAE 90.1.

B. Deflection and Thermal Movement: Provide installed CI rigid insulation panels that have been designed to resist project-specific wind loads, acting both inward and outward:

1. Panel Deflection: Deflection of the panel face shall not exceed L/120 normal to plane of the wall, where L is the unsupported span of the panel between load transfer locations.

2. Thermal Movements: Allow for free and noiseless horizontal and vertical thermal movement due to expansion and contraction of plywood sheathing over a temperature range of -20°F to +180°F at the panel surface.

a. Buckling, undue stress on fasteners, or any other detrimental effects of thermal movement are not permitted.

b. Installation procedures shall take into account the ambient temperature range at the time of the respective operation.

C. Fire Performance: Wall assemblies containing CI rigid insulation panels shall meet the requirements of NFPA 285 using the Intermediate-Scale Multi-Story Test Apparatus (ISMA), where required by code based on the design of this project.

1.05 SUBMITTALS

A. General: Provide submittals in accordance with Conditions of the Contract and Division 01 Submittal Procedures Section as follows:

B. Product Data: Submit material descriptions, dimensions of individual components, and profiles for each type of CI Panel.

C. Samples:

1. Submit 6 inches x 6 inches, or size as required, demonstrating CI Panel construction. Samples to be provided in thickness specified.

D. Quality Assurance Submittals:

1. CI Panel Material Certification: Submit an official written statement from the Manufacturer documenting that product raw materials meet specified standards. Certification shall be backed by test reports and/or material certificates.

2. CI Panel Certification: Submit an official written statement from the Manufacturer documenting that the CI rigid insulation panels comply with specified Performance Requirements and Testing Performance sections indicated in this specification. Certification shall be backed by test reports.

E. Closeout Submittals:

1. Warranty: Submit Manufacturer and Installer warranty documents as specified within the Warranty section of this specification.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Company with a minimum of 15 years of continuous experience manufacturing CI rigid insulation panels in the United States of America of the type specified:

a. Able to provide a list of other projects of similar size including approximate date of installation for each.

2. Installer Qualifications:

a. The Installer shall have:

i. Been in business of a similar trade and under the present company name for at least five (5) years prior to the start of this project, and

ii. Experience with similar sized sheathing installations, and

iii. Completed at least ten (10) successful sheathing installations within the last three (3) years

1) Acceptable, varying combinations of successful sheathing installations and/or years of experience shall be determined at the discretion of the Manufacturer.

b. The Installer must be capable of providing field service representation during installation.

B. Regulatory Code Agencies Requirements: Provide CI rigid insulation panels that have been evaluated and/or are in compliance with the following, where required:

1. International Code Council (ICC)

2. International Energy Conservation Code (IECC)

3. ASHRAE

C. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, and Manufacturer's installation details.

1.07 DELIVERY AND STORAGE

A. Upon receipt, perform visual inspection of CI rigid insulation panels and inventory to identify any damages that may have occurred during shipping or any missing panels.

B. Storage:

1. Store CI rigid insulation panels horizontally on pallets in a dry, well-ventilated environment under the protection of a temporary or permanent structure. If required to be stored in an exterior area, CI rigid insulation panels must be placed under a well-ventilated, waterproof covering.

2. Store CI rigid insulation panels a minimum of 4" above ground level to avoid contact with standing moisture (e.g. water, snow, etc.).

3. Store CI rigid insulation panels in an area protected from other construction activities and associated debris.

4. Storage temperatures are not to exceed 120°F. Protect CI rigid insulation panels from moisture and direct sunlight while on the job-site.

5. Do not stack more than 1500 pounds of CI rigid insulation panels on one pallet. Other materials shall not be stacked on, or placed in contact with, CI rigid insulation panels to prevent staining, denting, or other damages.

1.08 PROJECT CONDITIONS

A. Substrate Requirements: Exterior wall assembly, including exterior sheathing, with appropriate fire rating in place prior to CI rigid insulation panels.

B. Field Measurements: Verify locations of wall framing members and wall opening dimensions by field measurements prior to the installation of the CI rigid insulation panels. Field measurements to be taken once all substrate materials and adjacent materials are installed.

1. Verify spacing of wall framing members meets Manufacturer's requirements.

2. Notify General Contractor and Architect of spacing discrepancies.

C. Substrate Tolerances: The General Contractor is responsible for providing an acceptable substrate per Manufacturer's requirements including:

1. Adjacent substrate faces out-of-plane offset: +/- 1/8 inch, and

2. Level, plumb, and location control lines as indicated: 1/4 inch in any 20 feet, and

3. Any building elevation direction deviation: +/- 1/2 inch

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Material Warranty: Submit, to the Owner, the Manufacturer's standard warranty.

1. Warranty Period:

a. Material and Product Integrity: Thirty (30) days against plywood delamination due to manufacturing defects. Checking, leafing, splitting, and broken grain shall be excluded.

b. Thermal Performance: Fifteen (15) years against loss of thermal resistance greater than twenty (20) percent from published R-Value at 75 °F in accordance with ASTM C518.

C. Installation Warranty: Installer shall submit to the Owner a standard warranty document executed by an authorized company official. The warranty shall be in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

1. Warranty Period:

a. Workmanship: One (1) year warranty period commencing on Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 CI PANEL MANUFACTURERS

A. CI Panel Manufacturers:

1. Omega CI by Laminators Inc. – www.laminatorsinc.com

2. **Other CI Panel manufacturer who meets the requirements of this specification**

2.02 BOARD INSULATION

A. CI Panel Description

1. Construction:

a. A closed cell foam plastic core bonded on both sides to a coated glass facer with an additional fire-treated plywood layer on one side.

2. Thickness: 2.1 inches (nom), typ.

3. Foam Core: Polyisocyanurate (ISO), Type II, Class 2, Grade 3

4. Fire-Treated Plywood Thickness: 5/8 inch

5. Product:

a. On Types I, II, III, and IV Construction to any height above grade in accordance with the provisions of IBC Sections 2603.5.1 through 2603.5.7.

6. Testing Performance:

a. ASTM C209: Water absorption of the foam core less than 0.1% by volume.

b. ASTM C518: Thickness / R-Value of the panel of 2.1 inches / R-9.6 hr °F ft^2 / BTU

c. ASTM D1621: Compressive strength of the foam core rating of Grade 3 (25 psi minimum).

d. ASTM D2126: Dimensional stability of the foam core measured at 2% (lineal change) when tested at 7 days.

e. ASTM D3273: Resistance to mold of the foam core passes (10).

f. ASTM E84: Flame Spread Index (FSI) of the foam core of 20 and Smoke Developed Index (SDI) of the foam core of 250.

g. ASTM E96: Moisture vapor permeance of the foam core less than 1.2 perms (Class III).

B. Panel Fasteners

1. Type: As required by Manufacturer.

2.03 RELATED MATERIALS

A. General: Refer to Related Sections specified herein for other materials, including concrete, masonry, framing, sheathing, barriers, flashing and trim, windows, glazing, and/or curtain walls.

PART 3 – EXECUTION

3.01 INSTALLER INSTRUCTIONS

A. Compliance: Comply with Manufacturer's product data, including, but not limited to, installation guides, design details, product technical bulletins, supplemental technical instructions, and any other product packaging instructions.

3.02 PREPARATION

A. Site Verification of Conditions: Verify that conditions of substrate previously installed under other sections are acceptable for the CI rigid insulation panels installation. Documentation should be provided indicating any conditions detrimental to the performance of the CI rigid insulation panels.

3.03 INSTALLATION

A. Panel Installation:

1. Handling:

    a. Handle CI rigid insulation panels with work gloves to avoid hand injury from any plywood edges and to prevent potential irritation from the polyisocyanurate core.

    b. When removing individual CI rigid insulation panels from stacks, always lift one panel completely off the next to prevent localized surface gouges or crushing of the polyisocyanurate core.

2. Install the CI rigid insulation panels plumb, level, and true in accordance with Manufacturer's requirements.

3. Do not over-tighten fasteners along panel perimeter.

4. Cleanly trim CI rigid insulation panels to fit. Insulate any miscellaneous gaps and voids.

    a. Fit insulation tight to fenestrations and service openings, and match depth of CI rigid insulation panels.

5. Protect CI Panel edges from direct exposure to water and maintain dry conditions at all times. Any wet conditions shall be allowed to completely dry prior to the application of the air and water barrier (AWB).

6. Install AWB over CI rigid insulation panels as specified in Section 072726.

7. Installation Tolerances:

    a. Adjacent vertical or horizontal panel out-of-plane offset: +/- 1/8 inch

    b. Vertical or horizontal joint width: +/- 1/16 inch

    c. Maximum vertical or horizontal joint intersection deviation: 1/4 inch in any 20 feet

8. Do not cut or trim CI rigid insulation panels during installation in a manner which would damage the surface, decrease strength, or result in a failure in performance.

B. Related Products Installation Requirements: Refer to other sections in Related Sections for installation of related products.

3.04 REMEDIATION

A. Remediation:

1. Remove and replace CI rigid insulation panels damaged as a direct result of activities in the Panel Installation section.

2. Panel Installation completion shall be agreed-upon between the Installer and the General Contractor.

3. Following Panel Installation completion, any determination of replacement of CI rigid insulation panels is at the discretion of the Architect. Such replacement shall become the responsibility of the General Contractor.

4. Removal and replacement of CI rigid insulation panels damaged by other trades shall be the responsibility of the General Contractor.

5. If required after Panel Installation, any additional protection of the CI rigid insulation panels shall be the responsibility of the General Contractor.

6. Remove from project site damaged CI rigid insulation panels and other debris attributable to work of this section.

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

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:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
3. Spray-Applied Cellulosic Insulation

B. Related Requirements:
1. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.
2. Section 075423 “TPO” includes requirements for insulation below TPO at roof.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

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

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type X – For Above Grade Cavity Walls: ASTM C 578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

C. Extruded Polystyrene Board, Type IV- for below grade foundation walls and under concrete slabs. ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.
d. Pactiv Corporation.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

A. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

B. Glass-Fiber Blanket, Unfaced – where designated.: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Guardian Building Products, Inc.
c. Johns Manville; a Berkshire Hathaway company.
d. Knauf Insulation.
e. Owens Corning.

C. Glass-Fiber Blanket, Foil Faced – where designated: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Guardian Building Products, Inc.
c. Johns Manville; a Berkshire Hathaway company.
d. Knauf Insulation.
e. Owens Corning.

2.3 SPRAY-APPLIED CELLULOSIC INSULATION

A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Central Fiber LLC.
b. GreenFiber.
c. Hamilton Manufacturing Inc.
d. International Cellulose Corp.
e. Nu-Wool Co., Inc.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AGM Industries, Inc.
b. Gemco.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place for spandrel glass insulation conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Gemco.

2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.

3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction.
    b. Interior Walls: Set units with facing placed toward areas of high humidity

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.7 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
2. Install insulation to fit snugly without bowing.

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00