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**[SECTION 07 41 13
METAL ROOF PANELS]**
Kingspan Insulated Panels
KingRib Series Insulated Roof Panels

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Steel faced, polyisocyanurate foamed-in-place insulated roof panels.
- B. Accessories including fasteners, perimeter trim and penetration treatments.

1.2 REFERENCES

- A. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International
 - 1. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 2. ASTM A792: Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by Hot Dip Process.
 - 3. ASTM C273: Standard Test Method for Shear Properties of Sandwich Core Materials.
 - 4. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - 5. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - 6. ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics
 - 7. ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
 - 8. ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics
 - 9. ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

10. ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
11. ASTM E72; Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
12. ASTM E84; Standard Test Method for Surface Burning Characteristics of Building Materials
13. ASTM E108: Fire Tests of Roof Coverings
14. ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
15. ASTM E1592: Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
16. ASTM E1646; Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
17. ASTM E1680; Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems

C. FM Global (FM)

1. FM 4471; Approval Standard for Class 1 Panel Roofs
2. Approval Standard 4880; Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems.

D. International Building Code (IBC): current edition

E. UL Canada (ULC) Approvals:

1. CAN/ULC-S102: Standard Method of Test for Surface Building Characteristics of Building Materials and Assemblies
2. CAN/ULC-S126: Standard Method of Test for Fire Spread Under Roof Deck Assemblies.
3. CAN/ULC-S138: Standard Method of Test for Fire Growth of Insulated Building Panels in Full-Scale Room Configuration

1.3 SUBMITTALS

- A. Refer to Section **[01 33 00 Submittal Procedures]** **[insert section number and title]**.
- B. Product Data: Submit manufacturer current technical literature for each type of product.
- C. Shop Drawings: Submit detailed drawings and panel analysis showing:
 1. Profile

2. Gauge of both exterior and interior sheet
 3. Location, layout and dimensions of panels
 4. Location and type of fasteners
 5. Shape and method of attachment of all trim
 6. Locations and type of sealants
 7. Installation sequence
 8. Coordination Drawings: Provide elevation drawings and building sections which show panels in relationship to required locations for structural support. Include panel details and details showing attachment to structural support.
 9. Other details as may be required for a weathertight installation
- D. Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection L/240 (roof). Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout.
- E. Samples: [Provide nominal 3 x 5 inch of each color indicated.] [Provide panel width by 8 inches long minimum] [Insert size].
- F. Quality Assurance Submittals
1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with requirements.
 2. Manufacturer Erection Instructions: Provide manufacturer's written installation instructions including proper material storage, material handling, installation sequence, panel location(s), and attachment methods, details and required trim and accessories.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation meeting: Conduct a pre-installation meeting at the job site attended by Owner, Architect, Manufacturer's Technical Representative, Panel Installer, and Contractors of related trades. Coordinate structural support requirements in relation to insulated roof panel system, installation of any separate air/water barriers, treatment of fenestration, and other requirements specific to the project.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Manufacturer shall have a minimum of five (5) years experience in the production of insulated roof panels. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.

B. Installer Qualifications:

1. Installer shall be authorized by the panel manufacturer and the work shall be supervised by a person having a minimum of five (5) years experience installing insulated metal standing seam roof panels on similar type and size projects.
2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section [01 60 00 Product Requirements] [insert section number and title].
- B. Deliver panel materials and components in manufacturer's original, unopened, undamaged packaging with identification labels intact.
- C. Store roof panel materials on dry, level, firm, and clean surface. Stack no more than two bundles high. Elevate one end of bundle to allow moisture run-off, cover and ventilate to allow air to circulate and moisture to escape.

1.7 WARRANTY

- A. Limited Warranty: Standard form in which manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period. The items covered by the warranty include structural performance, bond integrity, deflection and buckling.
 1. Warranty Period: Two (2) years from date of Substantial Completion, or 2 years and 6 months from the date of shipment from manufacturer's plant, whichever occurs first.
- B. Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.
 1. Warranty Period: Twenty (20) years from date of Substantial Completion, or 20 years and 6 months from the date of shipment from manufacturer's plant, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Kingspan Insulated Panels, Inc., 726 Summerhill Drive, Deland, FL 32724 (888-882-5862); 2000 Morgan Road, Modesto, CA 95358 (800-377-5110) (www.kingspanpanels.us)
- B. Kingspan Insulated Panels Ltd. 12557 Coleraine Drive, Caledon, ON L7E 3B5 (866-442-3594); 5202-272nd Street, Langley, B.C. V4W 1S3 (866-442-3594) (www.kingspanpanels.ca).
- C. Basis of Design: [Kingspan RingRib3] [Kingspan KingRib5] Roof panels.
- D. Substitution Limitations:
 - 1. Submit written request for approval of substitutions to the Architect [a minimum of [14] days prior to the date for receipt of bids] [Insert time period]. Include the following information:
 - a. Name of the materials and description of the proposed substitute.
 - b. Drawings, cut sheets, performance and test data.
 - c. List of projects similar scope and photographs of existing installations.
 - d. Test reports indicating compliance with the performance criteria.
 - e. Other information necessary for evaluation.
 - 2. After evaluation by Architect, approval will be issued via addendum. No verbal approval will be given.

2.2 EXTERIOR ROOF PANELS

- A. Design Criteria – Roof Panels:
 - 1. Uplift Rating
 - a. Design Uplift Load: [Insert loads] psf per ASCE 7.
 - b. Design deflection criteria shall be L/240 for roof.
 - c. Units shall be rated and carry the following listings:
 - 1) Factory Mutual 1-60 uplift rating for 5 foot spans with minimum 16 gauge purlins
 - 2) Factory Mutual 4471 – Class 1 Approval
 - 2. Fire Classifications

- a. Factory Mutual Class 1A Approval when installed at a maximum roof slope of 5:12.

B. Performance Criteria – Roof Panels:

1. Structural Test: Structural performance shall be verifiable by witnessed structural testing for simulated wind loads in accordance with ASTM E72 and/or ASTM E1592.
2. Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a pressure differential of 12 psf, when tested in accordance with ASTM E1646.
3. Air Infiltration: Air infiltration through the panel shall not exceed 0.032 cfm/sf at 6.24 psf air pressure differential when tested in accordance with ASTM E1680.
4. Hailstorm Rating for roof panels: Factory Mutual 1 SH hailstorm rating
 - a. Tests performed in accordance with ASTM E84
5. Fire Test Response Characteristics for panels: Steel-faced panels with polyisocyanurate (ISO) core shall fully comply with Chapter 26 of International Building Code regarding the use of Foam Plastic.
 - a. FM 4880: Class I rated per FM Global, panels are approved for use without a thermal barrier and do not create a requirement for automatic sprinkler protection.
 - b. Flame Spread and Smoke Developed Tests on exposed Insulating Core:
 - 1) Flame Spread: Less than 25
 - 2) Smoke Developed: Less than 450
 - c. ASTM D1929 Minimum Flash and Self Ignition; established for foam core.
 - d. Exterior Fire Exposure Test: The roof panels shall be tested as a Class A material per ASTM E108.
 - e. NFPA 259 Potential Heat Content; established for foam core.
 - f. CAN/ULC S102, S126, S138 UL Canada fire test standards; successfully passed.
6. Insulating Core:
 - a. Minimum 90 percent closed cell structure (per ASTM D6226) urethane modified isocyanurate core with the following minimum physical properties:
 - b. Thermal Properties: The panel shall provide a nominal R-value of 7.1 [hr·ft²·°F/Btu] per inch thickness when tested in accordance with ASTM C518 at 75°F mean temperature and 8.1 [hr·ft²·°F/Btu] per inch thickness when tested in accordance with ASTM C518 at 35°F mean temperature
 - c. Density Nominal: 2.1-2.5 pcf per ASTM D1622
 - d. Shear Strength: 14 psi per ASTM C273

- e. Tensile Strength: 8.25 psi per ASTM D1623
- f. Compressive Strength: 14 psi per ASTM D1621
- g. Dimensional Stability: 14 day aged per ASTM D2126: -20 degree F < 1% chg, dry heat 158 degree F < 1.5% chg, Humid Heat 158 degree F/95% RH < 4.5% chg

C. Roof Panel Assembly Description:

1. Panel thickness: [1 1/2 inches] [2 1/2 inches] [4 inches] [5 inches] [6 inches] thick.
2. Panel width: 40 inches.
3. Panel Lengths: [Minimum 8 feet, maximum 50 feet] [Indicate length] [As indicated on Drawings].
4. Panel Attachment: Shall consist of exposed fasteners and saddle washers.
5. Exterior Face of Panel:
 - a. Material: AZ50/Galvalume/Zincalume per ASTM A792. Minimum Grade 33
 - b. Profile description – High Rib: [non-embossed with standing ribs spaced 20" on-center and lightly planked mesa intermediate ribs, KingRib3] [non-embossed with standing ribs spaced 10" on-center and lightly planked mesa intermediate ribs, KingRib5]
 - c. Texture: [Smooth (non-embossed)] [Non-directional stucco embossed].
 - d. Gauge: [26] [24] [22] gauge
 - e. Exterior Finish: [PVDF finish, dry film thickness of 1.0 mil including primer]
 - f. Color: [Selected from current Kingspan Insulated Panels [standard] [premium] color chart] [Custom color as selected by Architect] [Color indicated].
 - g. Location: Roof Panels.
 - 1) SRI: Minimum of [78] [29].
6. Interior Face of Panel:
 - a. Material: [AZ50/Galvalume/Zincalume per ASTM A792] [G90 galvanized steel in accordance with ASTM A653] minimum Grade 33
 - b. Profile: Shallow "lightly planked mesa ribs on 2.22" centers
 - c. Texture: [Non-directional Stucco embossed] [Smooth (non-embossed)]
 - d. Gauge: [26] [24] [22] gauge

e. Exterior Paint Finish Color:

- 1) [Selected from current Kingspan Insulated Roof Panels color chart]
[Custom color as selected by Architect] [Color indicated].

f. Interior Finish: [modified polyester, dry film thickness of 1.0 mil including primer.] [PVDF finish, dry film thickness of 1.0 mil including primer].

- 1) Color: [USDA Imperial White] [Selected from the current Kingspan Insulated Panels stock color chart] [same as exterior finish] [Custom color as selected by Architect] [Color indicated].

2.3 ACCESSORIES

A. Fasteners:

1. Structural fasteners: Self-drilling or self-tapping screws and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by factory-applied coating, with weather tight sealing washers.
2. Saddle washer for panel attachment shall include integral self-sealing gasket supplied by the manufacturer.
3. Stitch fasteners for roof panel sidelaps and endlaps shall be self-drilling low profile screws with sealing washers
4. Size and spacing: As recommended by manufacturer.

B. Perimeter Trim and Penetration Treatments: Fabricated perimeter trim, penetration treatments and metal flashing: Shall be same gauge, material and coating color as exterior face of insulated metal roof panel.

C. Butyl Sealants: Non-skinning/curing type as recommended by manufacturer.

D. Butyl Tape: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Provide field measurements to manufacturer as required to achieve proper fit of the preformed roof panel envelope. Measurements shall be provided in a timely manner so that there is no impact to construction or manufacturing schedule.

1. Supporting Steel: The contractor or installer shall examine the alignment of the steel supports before installing the metal roof panel system. The steel shall be

aligned to the tolerances established in the AISC code of standard practice, Section 8 and the supplemental modification control Section 7.11.

2. All structural supports required for installation of panels shall be by others. Support members shall be installed within the following tolerances:
 - a. Structural Tolerance: In the plane of the roof $\leq 3/16$ inches outward, 0 inches inward with a $1/8''$ maximum change in deviation for any member of any 10'-0'' run of panel.
 - b. Verify that bearing support has been provided perpendicular to the orientation of the panels. Width of support shall be as recommended by manufacturer.
 3. The face of all structural members to which the panels are attached must be in the same vertical plane, flat and free of obstructions, such as weld marks, bolts or rivet heads. In no case shall roof panels be fastened directly to structural framing members installed in the same direction of the roof panels.
- B. Examine individual panels upon removing from the bundle; notify manufacturer of panel defects. Do not install defective panels.

3.2 PANEL INSTALLATION

- A. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
- B. Install panels plumb, level, and true-to-line to dimensions and layout indicated on approved shop drawings.
- C. Cut panels prior to installing, where indicated on shop drawings, using a power circular saw with fine tooth carbide tip blade per manufacturer's instructions. Personnel should wear respiratory and eye protection devices.
- D. Butyl Weather Barrier Sealant:
 1. Apply non-skinning butyl sealant as shown on shop drawings and manufacturer's installation instructions as necessary to establish the vapor barrier for the panels.
 2. Use non-skinning butyl tube sealant only for tight metal-to-metal contact.
 3. Do not use non-skinning butyl tube sealant to bridge gaps.
- E. At roof panels endlap apply butyl sealing tape to panel surface to be lapped per manufacturer's instructions.

3.3 TRIM INSTALLATION

- A. Place trim and trim fasteners only as indicated per details on the approved shop drawings.
- B. Place a continuous strip of butyl tube sealant between the inside back face of closure trims and interior panel faces of panels for proper vapor seal.
- C. Fasten the exterior ridge trim at roof panels to the metal ridge closure trims, per manufacturer's recommendations, with 1/4 inch by 7/8 inch stitch fasteners.

3.4 SEALANT INSTALLATION FOR EXPOSED JOINTS AT ROOF PANELS

- A. Clean and prime surfaces to receive exterior exposed sealants in accordance with sealant manufacturer's recommendations.
- B. Follow sealant manufacturer's recommendations for joint width-to-depth ratio, application temperature range, size and type of backer rod, and compatibility of materials for adhesion.
- C. Direct contact between butyl and silicone sealants shall not be permitted.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: General Contractor shall engage an independent testing and inspection agency acceptable to the architect to perform field tests and inspections and to prepare reports of findings.

3.6 CLEANING AND PROTECTION

- A. Remove protective film immediately after installation.
- B. Touch-up, repair or replace metal panels and trim that have been damaged.
- C. Clean finished surfaces as recommended by metal panel manufacturer.
- D. Repair or replace any damaged or defective panels after determination of responsibility.

END OF SECTION

DISCLAIMER:

Kingspan Insulated Panels Guide Specifications have been written as an aid to the

professionally qualified Specifier and Design Professional. The use of this Guideline Specification requires the sole professional judgment and expertise of the qualified Specifier and Design Professional to adapt the information to the specific needs for the Building Owner and the Project, to coordinate with their Construction Document Process, and to meet all the applicable building codes, regulations and laws. KINGSPAN INSULATED PANELS EXPRESSLY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE OF THIS PRODUCT FOR THE PROJECT.