Insulated Metal Wall Panels
IBC 2018 - Based

An insulated metal panel, or IMP, is a roof or wall cladding element consisting of two metal skins surrounding an insulating core. Individual units connect through tongue-and-groove joinery and when installed as a system, are designed to provide a weather-resistant, vapor retarding thermal barrier suitable for use in commercial construction.

IMPs, like all other building materials, must meet the provisions of the building code in effect for the project and site under consideration. However, certain basic parameters listed in this specification are generally required for use on most commercial buildings in the US. This document is therefore being presented by the IMP Alliance of the Metal Construction Association (MCA) as an aid for designers to assist them in construction of project specifications, notes and other contract documents.

The scope of this document is a typical low-rise (i.e., 3 stories or less) commercial building of non-hazard occupancy as identified by the International Building Code, where IMPs with polyisocyanurate or polyurethane cores are used as the exterior sealed wall system (i.e., not a rainscreen or backer panel)

SECTION 07 41 13

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Factory [foamed-in-place | laminated] insulated metal wall panels with concealed fasteners, related trim and accessories

1.2 RELATED REQUIREMENTS

A. Division 07 “Thermal Insulation” for insulation of roof and wall assemblies

B. Division 07 “Roofing and Siding Panels” for insulated metal panels

C. Division 07 “Metal Roof and Wall Panels” for factory-formed metal wall or roof panels

D. Division 07 Section "Sheet Metal Flashing and Trim" for flashings and trim

1.3 REFERENCES

Specifier: Referenced Standard year of edition has been omitted for ease of maintenance. Generally, the edition of the referenced standards is that of Chapter 35 of the applicable version of IBC or IBC-based code, or latest version of the specification if not within one calendar year of release.

A. American Society of Heating, Refrigeration, Air Conditioning and Refrigeration Engineers (ASHRAE)

1. ANSI/ASHRAE/IES Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings (ASHRAE 90.1)

B. American Society of Testing Materials (ASTM)

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
2. ASTM A 755/A 755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Pre-painted by the Coil-Coating Process for Exterior Exposed Building Products
3. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

4. ASTM A 924/924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
5. ASTM C 273/C 273M - Standard Test Method for Shear Properties of Sandwich Core Materials
6. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
7. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
8. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics
9. ASTM D 1622/D 1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics
10. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
11. ASTM D 2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
12. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
13. ASTM D 4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
14. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
15. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
16. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
17. ASTM E 283/E 283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
18. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
19. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
20. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
21. ASTM E 2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.

C. FM Approvals (FM)

1. FM 4880 - Approval Standard for Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems
2. FM 4881 - Approval Standard for Class 1 Exterior Wall Systems

D. International Code Congress (ICC)

1. IBC 2018 - 2018 International Building Code

E. ICC Evaluation Service (ICC-ES)

1. ICC-ES AC04 - Acceptance Criteria for Sandwich Panels

F. National Fire Protection Association (NFPA)

Specifier: IBC 2018 references the 2012 edition of NFPA 285. However, some choose to adopt the 2019 version due to significant changes in the test procedure addressing panelized systems with joints. To eliminate confusion, this specification explicitly references 2012. Edit as necessary.

1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustibles Components, 2012 version.
2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

G. Underwriters Laboratories (UL)

1. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials
2. UL 1040 - Fire Test of Insulated Wall Construction
3. UL 1715 - Fire Test of Interior Finish Material

1.4 DESIGN REQUIREMENTS

A. The insulated metal wall panels shall be metal faced foam core sandwich panels produced on a [continuous | discontinuous] process manufacturing line under strict quality control and must be independently audited by a recognized audit facility/testing lab. The wall panel system (panel thickness, gauge, spans, connections) shall be designed to resist specified wind loads, thermally induced movement, and exposure to weather without failure.

1.5 DELIVERY STORAGE AND HANDLING

A. Protect products of metal panel system during delivery, storage, and handling to prevent staining, denting, deterioration of components or other damage. Product panels and trim bundles during shipping.

1. Deliver insulated metal panels in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
2. Store in accordance with manufacturer's written instructions.
3. Cover insulated metal panels with temporary shelter and from direct sunlight until all components are installed.

1.6 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's written two (2) year limited warranty providing materials to be free from defects in material and workmanship from the date of production excluding coil coatings and paint finishes that are covered under a separate warranty.

B. Paint Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and on the exterior paint finish for chalk, fade, and cracking.

Specifier: Choose applicable paint system specification.

1. Fluoropolymer (PVDF) Two-Coat System:

a. Chalk in excess of a numerical rating of eight (8) when measured in accordance with the standard procedures outlined in ASTM D 4214
b. Fade or change in color in excess of five (5) E units when calculated in accordance with ASTM D 2244. The color change is to be measured on exposed painted surface cleaned of surface soils and oxidation.
c. Failure of adhesion, peeling, checking, or cracking.
d. Warranty Period: Twenty (20) years from the date of Substantial Completion, or twenty (20) years and 3 months from the date of shipment from manufacturer's plant, whichever occurs first.

2. Silicone Modified Polyester (SMP) Two-Coat System:

a. Chalk in excess of a numerical rating of eight (8) when measured in accordance with the standard procedures outlined in ASTM D 4214
b. Fade or change in color in excess of five (5) E units when calculated in accordance with ASTM D 2244. The color change is to be measured on exposed painted surface cleaned of surface soils and oxidation.
c. Failure of adhesion, peeling, checking, or cracking.
d. Warranty Period: Twenty (20) years from the date of Substantial Completion, or twenty (20) years and 3 months from the date of shipment from manufacturer's plant, whichever occurs first.

C. Installer's Warranty: The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

PART 2 - MATERIALS

2.1 APPROVED MANUFACTURERS

A. All Weather Insulated Panels; 929 Aldridge Rd.; Vacaville, CA 95688; (888) 970-2947; sales@awipanels.com; www.awipanels.com

B. ATAS International; 6612 Snowdrift Rd.; Allentown, PA 18106; (800) 468-1441; info@atas.com; www.atas.com

C. CENTRIA; 1550 Coraopolis Heights Road Suite 500; Moon Township, PA 15108; (888) 254-7099; info@centria.com; www.centria.com

D. Green Span Profiles; 21200 FM 362; Waller TX 77484; (844) 807-7400; info@gsplc.com; www.greenspanprofiles.com

E. Kingspan Insulated Panels, Inc.; 726 Summerhill Dr.; DeLand, FL 32724; (877) 638-3266; info@kingspanpanels.us; www.kingspan.com

F. Metl-Span; 1720 Lakepointe Dr. Suite 101; Lewisville TX 75057; (877) 585-9969; info@metlspan.com; www.metlspan.com

G. Norbec Inc.; 97 Rue de Vaudreuil, Boucherville, QC J4B 1K7; (877) 667-2321; info@norbec.com; www.norbec.com

H. TrueCore; 801 Hunter Industrial Park Road; Laurens SC 29360; (864) 300-4131; info@truecorepanels.com; www.truecorepanels.com

2.2 PERFORMANCE REQUIREMENTS

A. Structural performance shall be as determined by suitable pressure chamber test (positive or negative loading) such as ASTM E 72, ASTM E330, or ASTM E 1592 applied in accordance with common industry practice and published guidance from a recognized third-party evaluation criteria such as ICC-ES (AC04) or IAPMO (UES)

1. Wind Loads: As determined by applicable building code or referenced standard.
2. Deflection Limit: [L/180 | L/240 | L/___]

B. Fire Performance

1. Insulated Metal Panels shall be listed and labeled in accordance with Section 2603.2 of IBC 2018
2. Foam plastic insulating cores shall meet the following requirements:
    a. Covered by corrosion-resistant steel having a base metal thickness of not less than 0.0160 inch (0.41 mm)
    b. Foam plastic insulating core shall be tested to ASTM E 84 or UL 723 and shall have the following characteristics:
        1) Flame spread index: 25 or less.
        2) Smoke developed index: 450 or less.

Specifier: Retain or delete the following section on the basis of applicability of the exceptions to IBC 2018 2603.5.5

3. Insulated Metal Panel assemblies shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

Specifier: Retain or delete the following section on the basis of applicability of the exceptions to IBC 2018 2603.4.1, or if the Special Approval of IBC 2018 2603.9 applies.

4. Insulated Metal Panels shall be specifically approved for use without a thermal barrier based on large-scale testing in accordance with one of the following tests:
    a. NFPA 286 with the following acceptance criteria:
        1) Flame shall not spread to the ceiling during the 40kW exposure.
        2) The flame shall not spread to the outer extremity of the sample on any wall or ceiling, or adjacent to the door.
        3) Flashover, as defined in NFPA 286, shall not occur.
        4) The peak heat release rate throughout the test shall not exceed 800 kW.
        5) The total smoke released throughout the test shall not exceed 1,000 m^2.
    b. UL 1040
    c. UL 1715
    d. FM 4880

Specifier: Retain or delete the following paragraph on the basis of FM Global insurability requirements for the project.

5. Insulated Metal Panel assemblies shall have a Class 1 rating for wall and ceiling construction with no height restrictions in accordance with FM 4881.

C. Thermal Performance:

Specifier: Choose U-factor or R-value compliance per ASHRAE 90.1 or applicable building energy efficiency standard. U-factor compliance requires item 1, while R-value compliance requires both items 2 and 3.

1. Assembly Heat Transfer Coefficient (U-factor) shall be determined by ASTM C 1363. Tested specimen must include at least two engaged side joints. Air film allowance shall be from ASHRAE 90.1 Section A9.4.1
2. Thermal Resistance (R-factor) of the foam core shall be determined by dividing the core nominal thickness by the k-factor for each product.

Specifier: The thermal conductivity of foam plastic changes with temperature. Many manufacturers test at 75 degree mean for comparability with fiberglass insulation. However, other temperatures may be used based on the use, occupancy and location of the building. The options shown below, 40°F mean (3.a.), or 75°F mean (3.b.) are common temperatures used in the industry and are recommended in ASTM C1058. Generally, only one is chosen.

3. Thermal Conductivity (k-factor) shall be determined by ASTM C 518 at the following temperature:
    a. 40°F (4.4°C) mean: Hot side ambient of 75±9°F (24±5°C), cold side ambient of 5±9°F (-15±5°C)
    b. 75°F (24°C) mean: Hot side ambient of 100±9°F (38±5°C), cold side ambient of 50±9°F (10±5°C)

D. Air Infiltration: Assemblies of materials and components (sealants, tapes, etc.) shall have an average air leakage no more than 0.04 cfm/ft^2 (0.2 l/s·m^2) under a pressure differential of 1.57 psf (75 Pa) when tested in accordance with ASTM E 283 or ASTM E 2357.

E. Weather Protection: Provide IMP system tested in accordance with ASTM E 331 under a pressure differential of 6.24 psf (300 Pa) for a test duration of 120 minutes.

2.3 INSULATED METAL WALL PANELS

A. The insulated metal wall panel shall have a side joint with a [horizontal interlocking concealed fastener | vertical double tongue and groover offset concealed fastener | vertical interlocking exterior skin lap exposed

fastener] design permitting exterior side installation. Fasteners shall be per manufacturer's fastening schedule and positively restrain the face sheet of the panel and adequately transfer loads to the structural supports.

1. Wet-Sealed Systems: Panel walls identified on the drawings as wet-sealed shall have a single, continuous bead of approved non-skinning butyl gun grade sealant applied at the panel joint prior to engagement as shown on the panel shop/erection drawings and as required by successful air/water penetration test.
2. Dry-Sealed Systems: Panel systems identified on the drawings as dry-sealed shall have a means to restrict air flow through the joints designed by the manufacturer and installed [in the factory | by the installer] prior to engagement as shown on the panel shop/erection drawings and as required by successful air/water penetration test.

Specifier: Choose U-factor or R-value compliance per ASHRAE 90.1 or applicable building energy efficiency standard. U-factor compliance requires item B, while R-value compliance requires both item C.

B. Provide Insulated Metal Panel assembly with a maximum Heat Transfer Coefficient (U-factor) of [___ Btu/hr·ft^2·°F (___ W/m^2·°C) | As shown on drawings].

C. Provide Insulated Metal Panels with a minimum R-factor of [___hr·ft^2·°F/Btu (___ m^2·°C/W) | As shown on drawings].

D. Exterior metal cover: G90 galvanized coated steel conforming to ASTM A 653 or AZ50 aluminum-zinc (Galvalume®) alloy coated steel, conforming to ASTM A 792, minimum Grade 33, pre-painted by the coil-coating process per ASTM A 755. General requirements as provided by ASTM A 924.

1. The exterior profile shall be [one of the manufacturer's standard panel profiles | as shown on drawings]
2. Nominal Uncoated Thickness: [0.019 inch (0.48mm) | 0.024 inch (0.61mm) | 0.029 inch (0.74mm)] minimum
3. Finish: [Fluoropolymer (PVDF) Two-Coat System | Silicone Modified Polyester (SMP) Two-Coat System]
    a. Thickness: 1.0 mil (0.025mm) nominal dry film thickness
4. Color: [As shown on drawings | As selected by Architect from manufacturer's standard colors | Match Architect's custom color]

E. Interior metal cover. G90 galvanized coated steel conforming to ASTM A 653 or AZ50 aluminum-zinc (Galvalume®) alloy coated steel, conforming to ASTM A 792, minimum Grade 33, pre-painted by the coil-coating process per ASTM A 755. General requirements as provided by ASTM A 924.

1. The interior profile shall be [one of the manufacturer's standard panel profiles | as shown on drawings]
2. Nominal Uncoated Thickness: [0.019 inch (0.48mm) | 0.024 inch (0.61mm) | 0.029 inch (0.74mm)] minimum
3. Finish: [Polyester Two-Coat System | Silicone Modified Polyester (SMP) Two-Coat System | [Fluoropolymer (PVDF) Two-Coat System]
    a. Thickness: 1.0 mil (0.025mm) nominal dry film thickness
4. Color: [Manufacturer's Standard White | As Shown on drawings]

F. The foam core shall meet or exceed the following physical properties:

1. Compressive Strength (ASTM D 1621): 20 psi (138 kPa) minimum
2. Density, in-place (ASTM D 1622): 2.0-2.6 pcf (32-42 kg/m^3)
3. Shear Strength (ASTM C 273): 28 psi (193 kPa) minimum
4. Tensile Adhesion (ASTM D 1623): 30 psi (207 kPa) minimum

5. Closed Cell Content (ASTM D 6226): 90% minimum
6. Dimensional Stability (ASTM D 2126): 14 day aged < 1% change at -20 °F (-29°C), Dry Heat 158 °F (70°C), Humid heat 158 degree °F (70°C)

2.4 METAL WALL PANEL ACCESSORIES

A. Flashings: The insulated metal panel manufacturer shall furnish either the formed metal flashings or the flat stock in the same gauge, color, and paint finish system as the panel facings

B. Panel Clips: Where shown on the panel shop/erection drawings, galvanized one-piece wall clips shall be provided by the panel manufacturer for use in concealed panel joints and shall be identical to clips used in testing.

C. Panel 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 factor-applied coating, with weather tight sealing washers.

D. Seals:

1. Wet-Sealed Systems: Provide non-skinning butyl sealant and/or butyl tape in accordance with manufacturer's shop/erection drawings.
2. Dry-Sealed Systems: Provide all means and materials necessary for sealing against air/water infiltration in accordance with manufacturer's shop/erection drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal panel system substrate with Installer. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.

1. The contractor or installer shall examine the alignment of the steel supports before installing the metal wall panel system.
2. Panel support tolerances:

    a. Maximum deviation of steel alignment shall be limited to -0 to +3/16 inch (-0 to +4.8 mm) from the control with a 1/8 inch (3.2 mm) maximum change in deviation for any member of any 120 inch (3 m) run of panel.

3. The erector shall not proceed with installation if steel support is not within the specified tolerances.
4. 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 vertically installed wall panels be fastened directly to structural columns or vertical framing members. In no case shall horizontally installed wall panels be fastened directly to structural beams or horizontal framing members.

3.2 METAL PANEL INSTALLATION

A. Manufacturer shall provide panel contractor with written instructions for recommended product storage and handling as well as standard installation procedures.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform tests and inspections and to prepare test reports.

3.4 PROTECTION AND CLEANING

A. Remove temporary protective films in accordance with manufacturer's written instructions. Do not leave IMPs with films in direct sunlight for more than two days.

B. Clean finished surfaces as recommended by metal panel manufacturer.

C. Repair or replace any damaged or defective panels after determination of responsibility.