

## SECTION 06 12 16

### STRUCTURAL INSULATED PANELS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Structural insulated panels (SIPs) with polyurethane core.
- B. Structural insulated panels (SIPs) with expanded polystyrene core.
- C. Structural insulated panels (SIPs) with Neopor core.

**\*\*NOTE TO SPECIFIER \*\* Delete panel core types not required for project.**

##### 1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 06 11 16 - Mechanically Graded Lumber.
- C. Section 34 11 33 - Timber Track Cross Ties.
- D. Section 06 20 13 - Exterior Finish Carpentry.

##### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM C 203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
  - 2. ASTM C 272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
  - 3. ASTM C 273 - Standard Test Method for Shear Properties of Sandwich Core Materials.
  - 4. ASTM C 297 - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.
  - 5. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - 6. ASTM D 1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
  - 7. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
  - 8. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion

- Properties of Rigid Cellular Plastics.
  - 9. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
  - 10. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 11. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. Underwriters Laboratories, Inc: UL 723 - Test for Surface Burning Characteristics of Building Materials
- C. The Engineered Wood Association: APA PRP-108 - Performance Standards and Qualification Policies for Structural-Use Panels.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product; manufacturer-specific installation instructions for SIP system, including preparation instructions and recommendations, and storage and handling requirements and recommendations.
- C. Shop Drawings: Submit shop drawings for SIPs showing layout, elevations, SIP details, product components and accessories. SIP installation drawing shall be reviewed by and sealed by a registered professional engineer qualified to perform such work. Deviations from standard detail and load design values shall be calculated and signed and sealed by a registered professional engineer.
- D. Samples: Submit 12 inch by 12 inch (305 mm by 305 mm) sample panel.
- E. SIP Code Compliance Report: Submit manufacturer's ICC-ES evaluation report for the International Building Code.
- F. Sustainable Design Submittals: LEED Rating System for New Construction.
  - 1. Certificates for Credit MR 5 Regional Materials: Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the regional economy and reducing the environmental impacts resulting from transportation.
    - a. Identify each regionally manufactured material, including its source and cost.
    - b. Identify each regionally extracted and manufactured material, including its source and cost.
  - 2. Certificates for Credit EQ 4.4 Low-Emitting Materials - Composite Wood and Agrifiber: Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.
    - a. Include statement that the composite wood products used in the panel system contain no added urea-formaldehyde resins.
- G. Sustainable Design Submittals: LEED Rating System for Homes.
  - 1. Certificates for Credit MR2 Environmentally Preferable Products: Increase demand for environmentally preferable products and products or building components that are extracted, processed, and manufactured within the region.
    - a. Provide manufacturer's information which identifies each regionally manufactured material, including its source and cost.
    - b. Provide manufacturer's information which identifies each regionally

extracted and manufactured material, including its source and cost.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be experienced in performing work of this section and shall specialize in installation of work similar to that required for this project. All work shall be performed in accordance with the manufacturer's installation manuals, and in accordance with manufacturer's panel layout drawings when supplied.
- B. Source Limitations: Obtain all SIPs from one manufacturer, through one source. Accessories shall be acceptable to the SIP manufacturer.
- C. Field Measurements: Provide field measurements of structure to SIPs manufacturer prior to fabrication of panels. Coordinate fabrication schedule to comply with project schedule requirements.
- D. Low-Emitting Materials - Composite Wood and Agrifiber: Provide composite wood products used in the panel system that contain no added urea-formaldehyde resins.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Erect panels in area designated by Architect.
  - 2. Do not proceed with remaining work until workmanship is approved by Architect.
  - 3. Correct mock-up area as required to produce acceptable work.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with SIP manufacturer ordering instructions and coordinate lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials from SIP manufacturer with identification labels or markings intact.
- C. Unloading: Off-load SIPs from delivery vehicle using method which will not damage SIPs, and as acceptable to the manufacturer.
- D. Storage: SIPs shall be fully supported using wood stickers, placed in level storage, and prevented from contact with the ground. Stickers shall be placed as recommended by manufacturer.
- E. Protection: SIPs shall remain in the manufacturer's protective wrap until needed for installation. Unused panels will be rewrapped and/or covered with a suitable covering that will prevent exposure to rain, snow, water, sunlight, dirt, mud, and any foreign matter that may affect SIP performance.
- F. Subsequent Construction: Coordinate installation of subsequent construction to avoid exposure of SIPs to rain, snow, high moisture, and ultraviolet light and as recommended by the manufacturer.

## 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer to the greatest extent practical. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.8 WARRANTY

- A. Panel manufacturer will provide lamination warranty documents for building Owner acceptance and execution upon completion. Manufacturer's standard forms shall be submitted.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Murus Company (The), which is located at: P. O. Box 220 3234 Rt. 549 ; Mansfield, PA 16933; Toll Free Tel: 800-626-8787 ; Tel: 570-549-2100; Email: [request info \(info@murus.com\)](mailto:info@murus.com); Web: [www.murus.com](http://www.murus.com)
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

### 2.2 STRUCTURAL INSULATED PANELS

- A. Murus Polyurethane Structural Insulated Panel (SIP) with Polyurethane Core: A stress skin panel manufactured using the proprietary manufacturing method of Uniform Dispersion Molding (UDM) complying with the following:
  - 1. Panel Type: MURUS OSB-2100PUR Structural Insulated Panel, OSB/PUR Foam Core/OSB.
  - 2. Panel Type: MURUS PTP-2100PUR Structural Insulated Panel, PTP/PUR Foam Core/PTP.
  - 3. Panel Type: MURUS CLAD-2100PUR Structural Insulated Panel, OSB/PUR Foam Core/OSB/Pine Cladding.
  - 4. Panel Type: MURUS CP-2100PUR Insulated Panel, OSB/PUR Foam Core/Sound Board.

**\*\*NOTE TO SPECIFIER \*\* Delete panel type not required for project.**

- 5. Thermal Characteristics: 4-5/8 inches (117 mm) thick SIP with R-27.
- 6. Thermal Characteristics: 5-5/8 inches (143 mm) thick SIP with R-34.
- 7. Thermal Characteristics: 6-5/8 inches (168 mm) thick SIP with R-41.

**\*\* NOTE TO SPECIFIER \*\* Delete panel thickness not required for project.**

- 8. Polyurethane Closed Cell Foam: Minimum of 2.2 pcf (35 kg/cu m) insulation meeting manufacturers quality standards and the following:
  - a. K Factor (aged foam): .145, ASTM C 518.
  - b. Compressive Strength: 23 psi, ASTM D 1621.
  - c. Compressive MOE: 682 psi, ASTM D 1621.
  - d. Shear Strength: 31 psi, ASTM C 273.
  - e. Shear Modulus: 203 psi, ASTM C 273.
  - f. Flexure MOR: 52 psi, ASTM C 203.
  - g. Flexure Modulus (MD): 587 psi, ASTM C 203.
  - h. Tensile Strength: 37 psi, ASTM D 1623.
  - i. Tensile Modulus: 611 psi, ASTM D 1623.
  - j. WVT/Perm Inches: 1.0, ASTM E 96.
  - k. Foam Fire Rating: Class 1, UL723.
  - l. Flame Spread: 20, UL723.
  - m. Smoke Developed: 300, UL723.
  - n. Transverse Load: ASTM E 72.
  - o. Combined Axial and Bending: ASTM E 72.
- 9. OSB: APA performance rating mark shall be identified on the panel, with an

Exposure 1 durability rating; minimum physical properties shall be tested and described in APA PRP-108 or NIST PS 2. 7/16 inch (11 mm) thickness unless noted otherwise.

10. Cam Locks: If indicated or required, shall be installed in the panel during the manufacturing process.
11. Wiring Chases: If indicated or required, shall be formed into the panel during the manufacturing process.
12. Sizes: As indicated; Murus polyurethane SIPs are available in sizes from 4 feet by 4 feet to 4 feet by 24 feet (1219 mm by 1219 mm to 1219 mm by 7315 mm).

B. Murus EPS Structural Insulated Panel (SIP) with Expanded Polystyrene Core: A stress skin panel manufactured by a pressure lamination process complying with the following:

1. Panel Type: MURUS OSB-2100EPS Structural Insulated Panel, OSB/EPS Foam Core/OSB.
2. Panel Type: MURUS CLAD-2100EPS Structural Insulated Panel, OSB/EPS Foam Core/OSB/Pine Clad.
3. Panel Type: MURUS NB-2100EPS Insulated Panel, OSB/EPS Foam Core.

**\*\*NOTE TO SPECIFIER \*\* Delete panel type not required for project.**

4. Thermal Characteristics: 4-1/2 inches (114 mm) thick SIP with R-15.
5. Thermal Characteristics: 6-1/2 inches (165 mm) thick SIP with R-23.
6. Thermal Characteristics: 8-1/4 inches (210 mm) thick SIP with R-29.
7. Thermal Characteristics: 10-1/4 inches (260 mm) thick SIP with R-37.
8. Thermal Characteristics: 12-1/4 inches (311 mm) thick SIP with R-45.

**\*\* NOTE TO SPECIFIER \*\* Delete panel thickness not required for project.**

9. Expanded Polystyrene Core: Minimum of .95 pcf (15 kg/cu m) insulation meeting manufacturer's quality standards and the following. Insulation manufacturer shall provide confirmation of Third Party Certification.

- a. K Factor: .26, ASTM C 518.
- b. Compressive Strength: 10 psi, ASTM D 1621.
- c. Flexural Strength: 25 psi min, ASTM C 203.
- d. Tensile Strength: 28 psi min, ASTM C 297.
- e. Shear Strength: 16 psi min, ASTM C 273.
- f. Shear Modulus: 440 psi min, ASTM C 273.
- g. Modulus of Elasticity: 915 psi min, ASTM C 203.
- h. WVT/Perm Inches: 5.0 max, ASTM E 96.
- i. Water Absorption (by volume): 4% max, ASTM C 272.
- j. Maximum Service Temperature: 165 degrees F.
- k. Foam Fire Rating: Class 1, ASTM E 84.
- l. Flame Spread: <25, ASTM E 84.
- m. Smoke Developed: <450, ASTM E 84.
- n. Transverse Load: ASTM E 72.
- o. Combined Axial and Bending: ASTM E 72.

10. OSB: APA performance rating mark shall be identified on the panel, with an Exposure 1 durability rating; minimum physical properties shall be tested and described in APA PRP-108 or NIST PS 2. 7/16 inch (11 mm) thickness unless noted otherwise.
11. Adhesives: Manufacturer-approved one part urethane laminating adhesive having an in-use temperature range of - 40 degree F to +250 degree F (-40 degree C to 121 degree C).
12. Wiring Chases: If indicated or required, shall be cut into the panel during the manufacturing process.
13. Sizes: As indicated; Murus NEOPOR SIPs are available in widths of 4 feet or

8 feet by lengths of 8 feet to 24 feet (1219 mm or 2438 mm by 1219 mm to 7315 mm).

- C. Murus NEOPOR Structural Insulated Panel (SIP) with NEOPOR Expanded Polystyrene Core: A stress skin panel manufactured by a pressure lamination process complying with the following:
1. Panel Type: MURUS OSB-2100NEOPOR Structural Insulated Panel, OSB/Neopor Foam Core/OSB.
  2. Panel Type: MURUS CLAD-2100NEOPOR Structural Insulated Panel, OSB/Neopor Foam Core/OSB/Pine Clad.
  3. Panel Type: MURUS NB-2100NEOPOR Insulated Panel, OSB/Neopor Foam Core.

**\*\*NOTE TO SPECIFIER \*\* Delete panel type not required for project.**

4. Thermal Characteristics: 4-1/2 inches (114 mm) thick SIP with R-17.
5. Thermal Characteristics: 6-1/2 inches (165 mm) thick SIP with R-26.
6. Thermal Characteristics: 8-1/4 inches (210 mm) thick SIP with R-34.
7. Thermal Characteristics: 10-1/4 inches (260 mm) thick SIP with R-43.
8. Thermal Characteristics: 12-1/4 inches (311 mm) thick SIP with R-52.

**\*\* NOTE TO SPECIFIER \*\* Delete panel thickness not required for project.**

9. Expanded Polystyrene Core: Minimum of .95 pcf (15 kg/cu m) insulation meeting manufacturer's quality standards and the following. Insulation manufacturer shall provide confirmation of Third Party Certification.
  - a. K Factor: .222, ASTM C 518.
  - b. Compressive Strength: 10 psi, ASTM D 1621.
  - c. Flexural Strength: 25 psi min, ASTM C 203.
  - d. Tensile Strength: 28 psi min, ASTM C 297.
  - e. Shear Strength: 16 psi min, ASTM C 273.
  - f. Shear Modulus: 440 psi min, ASTM C 273.
  - g. Modulus of Elasticity: 915 psi min, ASTM C 203.
  - h. WVT/Perm Inches: 5.0 max, ASTM E 96.
  - i. Water Absorption (by volume): 4% max, ASTM C 272.
  - j. Maximum Service Temperature: 165 degrees F.
  - k. Foam Fire Rating: Class 1, ASTM E 84.
  - l. Flame Spread: <25, ASTM E 84.
  - m. Smoke Developed: <450, ASTM E 84.
  - n. Transverse Load: ASTM E 72.
  - o. Combined Axial and Bending: ASTM E 72.
10. OSB: APA performance rating mark shall be identified on the panel, with an Exposure 1 durability rating; minimum physical properties shall be tested and described in APA PRP-108 or NIST PS 2. 7/16 inch (11 mm) thickness unless noted otherwise.
11. Adhesives: Manufacturer-approved one part urethane laminating adhesive having an in-use temperature range of - 40 degree F to +250 degree F (-40 degree C to 121 degree C).
12. Wiring Chases: If indicated or required, shall be cut into the panel during the manufacturing process.
13. Sizes: As indicated; Murus NEOPOR SIPs are available in widths of 4 feet or 8 feet by lengths of 8 feet to 24 feet (1219 mm or 2438 mm by 1219 mm to 7315 mm).

## 2.3 ACCESSORIES

- A. Fasteners: Galvanized ring shank panel nails, or panel screws, as specified by

panel manufacturer, for attachment of panel to frames, roofs, and corners. All fasteners to be sized and provided by manufacturer and installed per manufacturer's requirements. Do not use common fasteners.

- B. Foam Sealant: Compatible with all components of the panel and adjacent materials, provided by manufacturer.
- C. Construction Adhesive for Installing Dimensional Lumber: Supplied by contractor, acceptable to manufacturer.
- D. Dimensional Lumber: SPF #2 kiln-dried or better, or pre-engineered equivalent.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until foundation or slab have been properly prepared.
- B. If supporting framing and level line are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Installation shall be in strict accordance with manufacturer's published instructions, details, and the drawings that are part of the contract documents for this project. Conflicts between these documents shall be resolved in writing prior to start of construction.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. When storing panels, do not allow them to come into contact with the ground. Stored panels shall remain dry and in the manufacturer's original packaging. Do not allow panels to be stored in an unsupported manner.
- C. Roof panels shall be fully protected from weather by roofing materials or other means to provide temporary protection at the end of the day, or when rain or snow is imminent.
- D. Remove and replace insulated wall or roof panels which have become excessively wet or damaged before proceeding with installation of additional panels or other work.

END OF SECTION