SECTION 06 12 00

STRUCTURAL INSULATED PANELS

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 the Section.

1.2 SUMMARY

A. This section includes Structural Insulated Panels (SIPs).

1.3 SYSTEM DESCRIPTION

A. Structural Insulated Panels (SIPs) consist of oriented strand board (OSB) laminated with structural adhesives to an EPS insulation core, and SIP manufacturer supplied Laminated Insulated Posts, 2x, LVL, Insulated I-Joist or OSB spline connectors based on final engineered plans. Also to include sealants, SIP tape and SIP screws.

1.4 REFERENCES

A. ACSE 7 – Minimum Loads for Buildings and other Structures.

B. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

C. ASTM E1803 – Standard Test Method for Determining Structural Capacities of Insulated Panels.

D. DOC PS2 – Performance Standard for Wood-based Structural-Use Panels.

E. ICC ES AC04 – Acceptance Criteria for Sandwich Panels.

F. ICC ES AC05 – Acceptance Criteria for Sandwich Panels Adhesives.

G. ICC ES AC12 – Acceptance Criteria for Foam Plastic Insulation.

H. AWPA E12 – Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.

I. EPA – Registered products listing.

1.5 SUBMITTALS

A. Product Data: Submit product data for specified products.

1. SIP Code Compliance: Provide certified listing report for SIPs showing evidence of compliance with code requirements as an alternate method of construction. Submit current compliance report number showing conformance to the International Building Code (IBC) and International Residential Code (IRC). Code report shall include compliance with ICC ES AC04. Factory mark each piece of lumber with grade stamp of grading agency.

2. EPS Code Compliance: Provide ICC ES code report for EPS foam with evidence of compliance with code. Submit current compliance report numbers from ICC ES with conformance to the International Building Code (IBC) and International Residential Code (IRC). Code report shall include compliance with ICC ES AC12.

3. Manufacturer's Instructions: SIP Manufacturer's construction detail book and load design charts.

B. Shop Drawings: Submit shop drawings for SIPs showing layout, elevations, product components and accessories.

C. Calculations: Submit structural calculations by a design professional registered in the state the project is being constructed in and qualified to perform the design work.

D. Quality Assurance Submittals:

1. Certificate: Submit product certificate showing compliance with a Third Party Quality Control program.

2. SIPA Manufacture Member in Good Standing: Submit SIPA certificate as evidence showing SIP manufacture is a SIPA manufacturing member in good standing.

E. Warranty: Warranty documents specified herein.

1.6 QUALITY ASSURANCE

A. Structural Insulation Panel Manufacturer Qualifications: A manufacturer with minimum 10 years documented experience in fabrication and a member of the Structural Insulated Panel Association (SIPA).

1. Manufacturer's qualifications include providing professional engineering services needed to assume engineering responsibility.

2. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in this type of work.

B. Source Limitations: Obtain all SIPs through one manufacturer. All accessories to be furnished or recommended by one SIP manufacturer.

C. Comply with applicable requirements and recommendations of authorities having jurisdictions.

D. Structural Design Standard: ASTM E1803 – Standard Test Method for Determining Structural Capacities of Insulated Panels.

E. Installer Qualifications: Installer should be experienced in performing work of this section and should be specialized in installation of work similar to that required for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials from SIP manufacturer with identification labels or markings intact.

B. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

C. SIPs shall be fully supported in storage and prevented from contact with the ground. Stack SIPs on pallets or on supports at maximum of four feet on center.

D. SIPS shall be fully protected from weather. Protect against exposure to rain, water, dirt, mud, and other residue that may affect SIP performance. Cover stored SIPs with breathable protective wraps. SIPs shall be stored in a protected area.

1.8 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Structural Insulated Panels:
   1. Enercept, Inc.; 3100 9th Ave. SE, Watertown, SD 57201; (605) 882-2222

   2. Substitutions: See Section 01 60 00 – Product Requirements.

2.2 STRUCTURAL INSULATED PANELS

A. Structural Insulated Panels: Provide panels capable of withstanding design loads including dead load, live load, wind load and seismic load. Final engineering will determine final panel design.

B. Panel Thickness and Thermal Resistance, R-value:
   1. Nominal 6 ½" SIP (5 ½" core) with R-Value of 22.76 at 75º F and an R-Value of 24.56 at 40º F.
   2. Nominal 8 ¼" SIP (7 ¼" core) with R-Value of 29.49 at 75º F and an R-Value of 31.85 at 40º F.
   3. Nominal 10 ¼" SIP (9 ¼" core) with R-Value of 37.19 at 75º F and an R-Value of 40.19 at 40º F.
   4. Nominal 10 ½" SIP (9 ½" core) with R-Value of 38.16 at 75º F and an R-Value of 41.24 at 40º F.

5. Nominal 12 ¼" SIP (11 ¼" core) with R-Value of 44.89 at 75º F and an R-Value of 48.53 at 40º F.
6. Nominal 12 7/8" SIP (11 7/8" core) with R-Value of 47.30 at 75º F and an R-Value of 51.14 at 40º F.

2.3 MATERIALS

A. Oriented Strand Board: 7/16" thick, APA Exposure 1, DOC PS-2 span rating 24/16, minimum.

B. Expanded Polystyrene (EPS) Insulation Board:
   1. Density: UL certified for fire and physical properties of ASTM C578, Type I; 0.90pcf minimum. Insulation manufacture shall provide Third Party UL certification.

C. Adhesive: Manufacturer's standard; complying with ICC-ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives.

2.4 ACCESSORIES

A. Splines:
   1. Laminated Thermally Insulated Posts, LVL, 2x, or Insulated I-Joist for use in joining SIPs shall be factory installed by the SIP manufacturer. Spline connection determined by final engineered plans.
   2. OSB surface splines for use in joining SIPs shall be supplied by the SIP manufacture.

B. Fasteners: Corrosion resistant SIP screws compatible with SIP system shall be provided by the SIPs manufacturer.

   1. Wood Screws for attachment to wood.

   2. Heavy Duty Metal Screws for attachment to metal members (16 gauge to ¼")

   3. Light Duty Metal Screws for attachment to metal decks (18 gauge or thinner)

C. SIP Sealant: Shall be specifically designed for use with SIPs. Sealant must be compatible with all components of the SIP. Sealant shall be provided by the SIP manufacturer.

D. Dimensional Lumber: SPF, #2 or better, or engineered equivalent unless otherwise required by structural drawings.

E. Vapor Retarder SIP Tape: Tape with an adhesive suitable for indoor use, minimum 4 inch wide for use on SIP joints, 6 inch wide for use on gable wall to roof joints at the rake, 12 inch wide for connection of roof to exterior walls at the eave, and 18 inch wide for use at roof beams. SIP Tape shall be supplied by the SIP manufacturer.

2.5 Fabrication

A. SIPs shall be fabricated in accordance with approved Shop Drawings.

2.6 SOURCE QUALITY

A. Source Quality Assurance: Each SIP component required shall be supplied by SIP manufacturer and shall be obtained from selected SIP manufacturer or its approved supplier.

1. Each panel shall be labeled indicating evidence of Third Party certification.

2. SIP Manufacturer shall provide Lamination, R-value and warranty documents for building owner acceptance and execution. Manufacturer's standard forms will be submitted.

B. Source Quality: Obtain structural insulated panels from a single manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine foundations, sills, framing and other surfaces to receive structural insulated panels. Verify conditions suitable for installation. Report unsatisfactory conditions to SIP manufacturer, Structural Engineer and Architect. Do not proceed with structural insulated panel work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. SIP Installation

1. SIP Supports: Provide level and square foundation/ structural system/ substrate that support wall and/or roof SIPs. For wall SIPs, hold sill plate back from edge of rim board ½" (12mm) to allow exterior sheathing to line up with outside of rim board. Provide 1 ½" (38mm) diameter access holes in plating to align with electrical wire chases in SIPs. Provide adequate bracing of SIPs during erection. Remove debris from plate area prior to SIP placement.

2. SIP Fastening: Connect SIPs by nail as shown on drawings or per manufacturer's requirements. Screws of equal strength may be substituted for nails as specified by engineer. SIP sealant must be used together with each fastening technique. Where SIP Screw Fasteners are used, provide a minimum of 1" (25.4mm) penetration into support. Join SIPs using plates and thermally insulated connecting posts. Secure attachment with nails or screws, and SIP sealant. Apply SIP sealant per SIP manufacturer recommendations.

3. SIP Tape: Provide SIP Tape at joints between SIP wall panels, roof panels, and at the intersection of SIP roof and wall panels.

4. Vapor Retarders: Vapor retarders mandated by building code and installed by others per spec.

5. Thermal Barriers: Interior surfaces of SIPs shall be finished with a minimum of 15-minute thermal barriers, such as gypsum wallboard, nominal 1" (25mm) wood paneling, or other approved materials. Apply code approved thermal barriers according to building code requirements.

6. Restrictions: Do not install SIPs directly onto concrete. Do not put plumbing in SIPs without consulting SIP manufacturer. Do not over cut skins for field-cut openings and do not cut skins for electric chases. SIPs shall be protected from exposure to solvents and their vapors that damage the EPS foam core.

7. Remove and replace insulated wall or roof SIPs which have become excessively wet or damaged before proceeding with installation of additional SIPs or other work.

3.3 FIELD QUALITY REQUIREMENTS

A. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

3.4 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

1. Roof SIPs: Protect roof SIPs from weather by roofing materials to provide temporary protection at the end of the day or when rain or snow is imminent.

2. After installation, cover SIPs to prevent contact with water on exposed SIP edges and faces.

END OF SECTION

Wall and Roof R-Values

4 3/8" Standard Wall Panel

Through Insulated Area		Through Unbroken Studs	
Outside Air Film	0.17	Outside Air Film	0.17
Lap Siding	0.81	Lap Siding	0.81
7/16" OSB	0.55	7/16" OSB	0.55
3 5/8" EPS	13.99	2x4 Stud	4.38
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.68	Inside Air Film	0.68
Total R Values	17.2		7.59

8 1/8" Standard Roof Panel

Through Insulated Area		Through Unbroken Studs	
Outside Air Film	0.17	Outside Air Film	0.17
Asphalt Shingles	0.44	Asphalt Shingles	0.44
Roofing Felt	0.81	Roofing Felt	0.81
7/16" OSB	0.55	7/16" OSB	0.55
7 3/8" EPS	28.39	2x8	9.1
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.61	Inside Air Film	0.61
Total R Values	31.97	Total R Values	12.07

6 3/8" Standard Wall Panel

Through Insulated Area		Through Insulated Studs	
Outside Air Film	0.17	Outside Air Film	0.17
Lap Siding	0.81	Lap Siding	0.81
7/16" OSB	0.55	7/16" OSB	0.55
		2x4 Stud	1.88
5 5/8" EPS	21.66	2 1/2" EPS Core	10.5
		2x4 Stud	1.88
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.68	Inside Air Film	0.68
Total R Values	24.87		17.47

10 3/8" Standard Roof Panel

Through Insulated Area		Through 3/8" OSB I-joist Web	
Outside Air Film	0.17	Outside Air Film	0.17
Asphalt Shingles	0.44	Asphalt Shingles	0.44
Roofing Felt	0.81	Roofing Felt	0.81
7/16" OSB	0.55	7/16" OSB	0.55
9 5/8" EPS	37.06	3/8" I-joist web	0.52
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.61	Inside Air Film	0.61
Total R Values	40.03	Total R Values	3.49

8 1/8" Standard Wall Panel

Through Insulated Area		Through Insulated Studs	
Outside Air Film	0.17	Outside Air Film	0.17
Lap Siding	0.81	Lap Siding	0.81
7/16" OSB	0.55	7/16" OSB	0.55
		2x4 Stud	1.88
7 3/8" EPS	28.39	4 1/4" EPS Core	17.85
		2x4 Stud	1.88
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.68	Inside Air Film	0.68
Total R Values	31.60		24.82

12 3/4" Standard Roof Panel

Through Insulated Area		Through 3/8" OSB I-joist Web	
Outside Air Film	0.17	Outside Air Film	0.17
Asphalt Shingles	0.44	Asphalt Shingles	0.44
Roofing Felt	0.81	Roofing Felt	0.81
7/16" OSB	0.55	7/16" OSB	0.55
12" EPS	46.2	3/8" I-joist web	0.52
7/16" OSB	0.55	7/16" OSB	0.55
6 mil Poly Barrier	0.00	6 mil Poly Barrier	0.00
Gypsum board	0.45	Gypsum board	0.45
Inside Air Film	0.61	Inside Air Film	0.61
Total R Values	49.17	Total R Values	3.49

*Federal Trade Commission ruling: Use the 75 deg F R-value when calculationg R-values for residential construction(fact sheets availible upon request)

The R-value of EPS increase as temperature decreases.