



PRODUCT: Structural Insulated Panels (SIP)
DIVISION: Wood and Plastics (06)
SECTION: Structural Panels (06 12 06)

Report Holder
General Panel Corporation
PO Box 279
2604 Sunset Drive
Grenada, Mississippi 38901

Manufacturing Locations

General Panel Corporation (NTA Plant #550)
2604 Sunset Drive
Grenada, Mississippi 38901

1. SUBJECT

1.1. General Panel Wall and Roof Structural Insulated Panels. Wall and Roof Panels 8 ft to 24 ft long, 6-1/2 in. to 10-1/4 in. thick.

2. SCOPE

2.1. NTA, Inc. has evaluated the above product(s) for compliance with the applicable sections of the following codes:

2.1.1. 2009 International Building Code (IBC)

2.1.2. 2009 International Residential Code (IRC)

2.2. NTA, Inc. has evaluated the above product(s) in accordance with:

2.2.1. NTA IM 014 Structural Insulated Panel Evaluation

2.2.2. NTA IM 036 Quality System Requirements

2.3. NTA, Inc. has evaluated the following properties of the above product(s):

2.3.1. Structural performance under axial, transverse and racking loads.

To obtain the most current NTA Listing Report visit www.ntainc.com/product-certification/.

3. USES

3.1. General. *Structural Insulated Panels* are used as structural insulated wall and roof panels capable of resisting transverse, axial and in-plane shear loads.

3.2. Construction Types. *Structural Insulated Panels* shall be considered combustible building elements when assessing construction type in accordance with 2009 IBC Chapter 6. (IM 014 NACU1)

3.3. Fire Resistive Assemblies. *Structural Insulated Panels* shall not be used as part of a fire-rated assembly unless suitable evidence and details are submitted and approved by the authority having jurisdiction. (IM 014 ACU14)

4. DESCRIPTION

4.1. General. *Structural Insulated Panels* are factory-assembled, engineered-wood-faced, structural insulated panels (SIPs) with an expanded polystyrene (EPS) foam plastic core. The panels are intended for use as load bearing or non-load bearing wall and roof components. Panels are available in 6-1/2 in. through 10-1/4 in. overall thicknesses. The panels are custom made to the specifications for each use and are assembled under factory-controlled conditions. The maximum panel size is 8 ft wide and up to 24 ft in length.

4.2. Materials.

4.2.1. Facing. The facing consists of two single-ply oriented strand board (OSB) facings a minimum of 7/16 in. thick conforming to values in 2009 IRC Table 613.3.2 and complying with DOC PS 2-92, Exposure 1, Rated Sheathing with a span index of 24/16. Panels shall be manufactured with the facing strength axis oriented parallel with respect to the direction of SIP bending. (IM 014 ACU4)

4.2.2. Core. The core material is expanded polystyrene (EPS) foam conforming to the Type I specification defined in ASTM C578. The foam core up to 4 in. thick has a flame spread rating not exceeding 75 and a smoke-developed index not exceeding 450.

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4.2.3. Adhesive. Facing materials are adhered to the core material using a structural adhesive. The adhesive is applied during the lamination process in accordance with the in-plant quality control manual.

4.2.4. Material Sources. The facing, core and adhesive materials used in the construction of *Structural Insulated Panels* shall be composed only of materials from approved sources as identified in the in-plant quality system documentation.

4.2.5. Splines. *Structural Insulated Panels* are interconnected with surface splines or block splines (Figure 1). Connections using dimensional lumber splines or engineered structural splines are not specifically addressed in this report and must be designed in accordance with accepted engineering practice to meet applicable code requirements. ^(IM 014 ACU20)

4.2.5.1. Surface Splines. Surface splines (Figure 1) consist of 3 in. wide x 7/16 in. thick or thicker OSB. At each panel joint, one surface spline is inserted into each of two tight-fitting slots in the core. The slots in the core are located just inside the facing.

4.2.5.2. Block Splines. Block Splines (Figure 1) are manufactured in the same manner as the SIP except with an overall thickness that is 1 in. less than the overall thickness of the panels to be joined.

5. DESIGN

5.1. Overall Structural System. The scope of this report is limited to the evaluation of the SIP component. Panel connections and other details related to incorporation of the panel into the overall structural system of a building are beyond the scope of this report. ^(IM 014 NACU3)

5.2. Design Approval. Where required by the authority having jurisdiction, structures using *Structural Insulated Panels* shall be designed by a registered design professional. Construction documents, including engineering calculations and drawings providing floor plans, window details, door details and connector details, shall be submitted to the code official when application is made for a permit. The individual preparing such documents shall possess the necessary qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken. Approved construction documents shall be available at all times on the jobsite during installation. ^(IM 014 NACU4)

5.3. Design Loads. Design loads to be resisted by *Structural Insulated Panels* shall be as required under the applicable building code. Loads shall not exceed the loads noted in this report.

5.4. Allowable Loads. Allowable axial, transverse and racking loads may be calculated using the panel properties provided in Tables 1 and 2 or may be selected from Tables 3 through 5. Maximum and minimum panel heights, spans and thicknesses are limited as provided in Tables 2 through 5. Unless otherwise noted, all properties and allowable loads apply to panels joined with surface or block splines. Allowable loads for reinforced panel capacities shall be designed by a registered professional. Calculations demonstrating that the loads applied are less than the allowable loads described in this report shall be submitted to the code official for approval. ^(IM 014 NACU5) For loading conditions not specifically addressed herein, structural members designed in accordance with accepted engineering practice shall be provided to meet applicable code requirements.

5.5. Concentrated Loads. Axial loads shall be applied to the SIP through continuous members such as structural insulated roof or floor panels or repetitive members such as joists, trusses or rafters spaced at regular intervals of 24 in. on center or less. Such members shall be fastened to a rim board or similar member to distribute the load to the SIP. For other loading conditions reinforcement shall be provided. This reinforcement shall be designed in accordance with accepted engineering practice. ^(IM 014 ACU12)

5.6. Eccentric and Side Loads. Axial loads shall be applied concentrically to the top of the SIP. Loads shall not be applied eccentrically or through framing attached to one side of the panel (such as balloon framing) except where additional engineering documentation is provided. ^(IM 014 ACU13)

5.7. Openings. Openings in panels shall be reinforced with structural materials designed in accordance with accepted engineering practice to resist all loads applied to the opening as required by the adopted code. Details of the door and window openings shall be provided to clarify the manner of supporting axial, transverse and/or racking shear loads at openings. Such details shall be shown on approved design documents and subject to approval by the local authority having jurisdiction. ^(IM 014 ACU8)

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5.8. In-Plane Shear Design. Shear walls utilizing block or surface splines shall be sized to resist all code required wind and seismic loads without exceeding the allowable loads provided in Table 5. The maximum panel height-to-width ratio shall be 2:1. ^(IM 014 ACU17) Shear wall chords, hold-downs and connections to transfer shear forces between the wall and surrounding structure shall be designed in accordance with accepted engineering practice. Allowable strengths for shear walls with structural splines along each panel edge shall be designed in accordance with accepted engineering practice and subject to the limitations for wood sheathed shear walls.

5.8.1. Seismic Design. The use of the shear walls (racking shear) is limited to structures in Seismic Design Categories A, B and C. Where SIPs are used to resist seismic forces the following factors shall be used for design: Response Modification Coefficient, $R = 2.0$; System Overstrength Factor, $\Omega_o = 2.5$; Deflection Amplification Factor, $C_d = 2.0$. ^(IM 014 ACU16)

5.9. Combined Loads. Panels subjected to any combination of transverse, axial or in-plane shear loads shall be analyzed utilizing a straight line interaction in accordance with *NTA IM14 TIP 01 SIP Design Guide*.

6. INSTALATION

6.1. General. *Structural Insulated Panels* shall be fabricated, identified and erected in accordance with this report, the approved construction documents and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report shall govern. Approved construction documents shall be available at all times on the jobsite during installation. ^(IM 014 NACU7)

6.2. Splines. *Structural Insulated Panels* are interconnected at the panel edges through the use of a spline. The spline type may be of any configuration listed in Section 4.2.5 as required by the specific design. The spline shall be secured in place with not less than 0.113 in. x 2-3/8 in. nails, spaced 6 in. on center, or an approved equivalent fastener. Alternate spline connections may be required for panels subjected to in-plane racking forces. Such panels shall be interconnected with the minimum fasteners required in Table 5 or as directed by the designer.

6.3. Plates. The top and bottom plates of the panels shall be dimensional or engineered lumber sized to match the core thickness of the panel. The plates shall be secured using not less than 0.113 in. x 2-3/8 in. nails, spaced 6 in. on center, on both sides of the panel or an approved equivalent fastener.

6.4. Cutting and Notching. No field cutting or routing of the panels shall be permitted except as shown on approved construction documents. ^(IM 014 NACU6)

6.5. Protection from Decay. SIPs that rest on exterior foundation walls shall not be located less than 8 in. from exposed earth. SIPs supported by concrete or masonry that is in direct contact with earth shall be protected from the concrete or masonry by a moisture barrier. ^(IM 014 ACU6)

6.6. Protection from Termites. In areas subject to damage from termites, SIPs shall be protected from termites using an approved method. Panels shall not be installed below grade or in contact with earth. ^(IM 014 ACU7)

6.7. Heat-Producing Fixtures. Heat-producing fixtures shall not be installed in the panels unless protected by a method approved by the code official or documented in test reports. ^(IM 014 NACU9)

6.8. Voids and Holes

6.8.1. Voids in Core. In lieu of openings designed in accordance with section 5.7, the following voids are permitted. Voids may be provided in the panel core during fabrication at predetermined locations only. Voids parallel to the panel span shall be limited to a single 1 in. maximum diameter hole. Such voids shall be spaced a minimum of 4 ft. on center measured perpendicular to the panel span. Two 1/2 in. diameter holes may be substituted for the single 1 in. hole provided they are maintained parallel and within 2 in. of each other. ^(IM 014 ACU11)

Voids perpendicular to the panel span shall be limited to a single 1.5 in. maximum hole placed not closer than 12 in. from the support. Additional voids in the same direction shall be spaced not less than 32 in. on center.

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6.8.2. Holes in Panels. Holes may be placed in panels during fabrication at predetermined locations only. Holes shall be limited to 4 in. x 4 in. square. The minimum distance between holes shall not be less than 4 ft. on center measured perpendicular to the panel span and 24 in. on center measured parallel to the panel span. Not more than three holes shall be permitted in a single line parallel to the panel span. The holes may intersect voids permitted elsewhere in this report. ^(IM 014 ACU15)

6.9. Panel Cladding

6.9.1. Roof Covering. The roof covering, underlayment and flashing shall comply with the applicable codes. All roofing materials must be installed in accordance with the manufacturer's installation instructions. The use of roof coverings requiring the application of heat during installation shall be reviewed and approved by a registered design professional.

6.9.2. Exterior Wall Covering. Panels shall be covered on the exterior by a water-resistive barrier as required by the applicable code. The water-resistive barrier shall be attached with flashing in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer. ^(IM 014 ACU9) The exterior facing of the SIP wall shall be covered with weather protection as required by the adopted building code or other approved materials. ^(IM 014 ACU10)

6.9.3. Interior Finish. The SIP foam plastic core shall be separated from the interior of the building by an approved thermal barrier of 1/2 in. gypsum wallboard or equivalent thermal barrier where required by 2009 IBC Section 2603.4.

7. CONDITIONS OF USE

Structural Insulated Panels as described in this report comply with the codes listed in Section 2 above, subject to the following conditions:

- 7.1.** Installation complies with this report and the approved construction documents.
- 7.2.** This report applies only to the panel thicknesses specifically listed herein. ^(IM 014 ACU3)
- 7.3.** In-use panel heights/spans shall not exceed the values listed herein. Extrapolation beyond the values listed herein is not permitted. ^(IM 014 ACU2)
- 7.4.** The panels are manufactured in the production facility noted in this report. ^(IM 014 NACU8)

8. EVIDENCE SUBMITTED

NTA, Inc. has examined the following evidence to evaluate this product:

- 8.1.** Review of plant quality system documentation in accordance with NTA IM 036.
- 8.2.** Plant certification inspection of manufacturer's production facilities, test procedures, frequency and quality control sampling methods, test equipment and equipment calibration procedures, test records, dates and causes of failures when applicable in accordance with NTA IM 036.
- 8.3.** Qualification test data in accordance with NTA IM 014 Standard Evaluation Plan 01 (IM 014 SEP 01).
- 8.4.** Periodic quality assurance audits of the production facility.
- 8.5.** Periodic testing in accordance with NTA IM 014.

Evaluation evidence and data are on file with NTA, Inc. NTA, Inc. is accredited by the International Accreditation Service (IAS) as follows:

ISO17020 Inspection Agency (AA-682)
ISO17025 Testing Laboratory (TL-259)
ISO Guide 65 Product Certification Agency (PCA-102)

The scope of accreditation related to testing, inspection or product certification pertain only to the test methods and/or standard referenced therein. Design parameters and the application of building code requirements, such as special inspection, have not been reviewed by IAS and are not covered in the accreditation. Product evaluations are performed under the direct supervision of Professional Engineers licensed in all jurisdictions within the United States as required by the building code and state engineering board rules.

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**9. FINDINGS**

All products referenced herein are manufactured under an in-plant Quality Assurance program to insure that the production quality meets or exceeds the requirements of the codes noted herein and the criteria as established by NTA, Inc. Furthermore, product must comply with the conditions of this report.

This report is subject to annual renewal.

10. IDENTIFICATION

Each eligible product shall be permanently marked to provide the following information:

- 10.1. The NTA, Inc. listing mark, shown below
- 10.2. NTA Listing No. GNP072310-1
- 10.3. In-plant quality assurance stamp
- 10.4. Identifier for production facility
- 10.5. Project or batch number



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Table 1: Basic Properties^{1,2}

Property	Strong-Axis Bending
Allowable Tensile Stress, F_t (psi)	495
Allowable Compressive Stress, F_c (psi)	345
Elastic Modulus (Bending), E_b (psi)	1032000
Shear Modulus, G (psi)	357
Allowable Core Shear Stress, F_v (psi)	3.3
Reference Depth, h_o (in.)	6.5
Shear Depth Factor Exponent, m	0.88

¹ All properties are based on a minimum panel width of 24 inches.

² Refer to *NTA IM14 TIP 01 SIP Design Guide* for details on engineered design using basic panel properties.

Table 2: Section Properties

Panel Thickness, h (in.)	Core Thickness, c (in.)	Dead Weight, w_d (psf)	Facing Area, A_f (in. ² /ft)	Shear Area, A_v (in. ² /ft)	Moment of Inertia, I (in. ⁴ /ft)	Section Modulus, S (in. ³ /ft)	Radius of Gyration, r (in.)	Centroid-to-Facing Dist., y_c (in.)
6.50	5.63	3.3	10.5	72.8	96.5	29.7	3.03	3.25
8.25	7.38	3.4	10.5	93.8	160.2	38.8	3.91	4.13
10.25	9.38	3.6	10.5	117.8	252.7	49.3	4.91	5.13

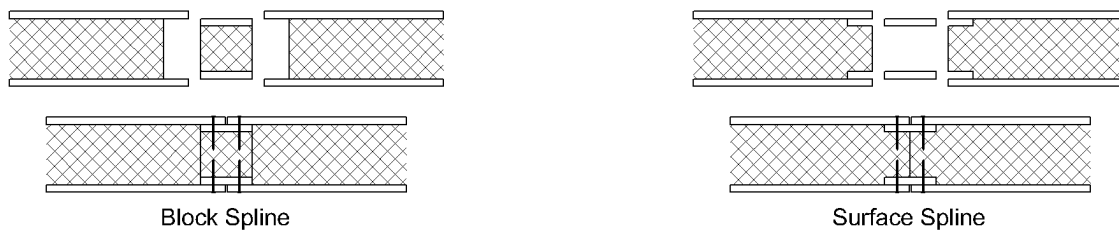


Figure 1: SIP Spline Types

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Table 3: Allowable Uniform Transverse Loads (continued) ^{1, 3, 4}

Panel Length (ft)	6-1/2 inch Thick SIP			8-1/4 inch Thick SIP			10-1/4 inch Thick SIP		
	Deflection Limit ²			Deflection Limit ²			Deflection Limit ²		
	L/180	L/240	L/360	L/180	L/240	L/360	L/180	L/240	L/360
8	72.0	72.0	57.7	78.7	78.7	77.8	79.5	79.5	79.5
10	55.4	55.4	41.5	59.9	59.9	57.1	63.6	63.6	63.6
12	45.0	45.0	30.8	48.4	48.4	43.1	51.8	51.8	51.8
14	37.9	35.0	23.3	40.5	40.5	33.3	43.2	43.2	43.2
16	32.7	27.0	18.0	34.9	34.9	26.2	37.1	37.1	36.1
18	28.3	21.2	14.1	30.6	30.6	20.8	32.4	32.4	29.1
20	22.5	16.9	11.3	27.3	25.2	16.8	28.9	28.9	23.7

¹Table values assume a simply supported panel with 1-1/2 inches of continuous bearing on facing at supports ($C_v = 1.0$) with solid wood plates at bearing locations. Values do not include the dead weight of the panel.

²Deflection limit shall be selected by building designer based on the serviceability requirements of the structure and the requirements of adopted building code. Values are based on loads of short duration only and do not consider effects of creep.

³Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.

⁴For wall panel capacities utilizing a zero bearing configuration, shown in Figure 2, multiply the allowable uniform load shown by $C_v = 0.77$.

Required connections must be made on each side of the panel. Fasteners shall be equivalent to 0.113 in. x 2-3/8 in. nails spaced 6 in. oc. into dimensional or engineered lumber having an equivalent specific gravity of 0.42 or greater.

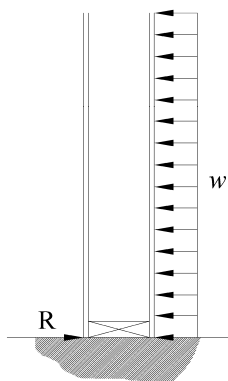


Figure 2: Zero Bearing Support

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Table 4: Allowable Axial Loads (plf)^{1,2,3,4}

Lateral Brace Spacing (ft)	Overall SIP Panel Thickness		
	6-1/2 inch	8-1/4 inch	10-1/4 inch
8	2540	2590	2620
10	2500	2570	2610
12	2450	2540	2590
14	2390	2500	2570
16	2320	2460	2540
18	2240	2420	2510
20	2150	2360	2480

¹Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.

²All values are for normal duration and may not be increased for other durations.

³Axial loads shall be applied concentrically to the top of the panel through repetitive members spaced not more than 24 inches on center. Such members shall be fastened to a rim board or similar member to distribute load along the top of the panel.

⁴The ends of both facings must bear on the supporting foundation or structure to achieve the tabulated axial loads.

Table 5: Allowable In-Plane Shear Strength (Pounds per Foot) for SIP Shear Walls (Wind and Seismic Loads in Seismic Design Categories A, B and C)^{1,2}

Spline Type ³	Overall SIP Panel Thickness (in.)	Minimum Facing Connections ^{2,4}			Shear Strength (plf)
		Chord ²	Plate ²	Spline ³	
Block or Surface Spline	6-1/2	0.113"x 2-3/8" nails, 6" oc	0.113"x 2-3/8" nails, 6" oc	0.113"x 2-3/8" nails, 6" oc	250
	10-1/4	0.113"x 2-3/8" nails, 6" oc	0.113"x 2-3/8" nails, 6" oc	0.113"x 2-3/8" nails, 6" oc	265

¹Maximum shear wall dimension ratio shall not exceed 2:1 (height:width) for resisting wind or seismic loads.

²Chords, hold downs and connection to other structure elements must be designed by a registered design professional in accordance with accepted engineering practice.

³Spline type at interior panel-to-panel joints only; solid chords members are required at each end of each shear wall segment.

⁴Required connections must be made at each side of the panel. Dimensional or engineered lumber shall have an equivalent specific gravity of 0.42 or greater.

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