ICC-ES Evaluation Report

ESR-5346

issued *February 2025*

Subject to renewal *February 2026*

This report also contains:

- **City of LA Supplement**
- **CA Supplement w/ Exterior Wildfire Exposure**
- **FL Supplement w/ HVHZ**

DIVISION: 06 00 00 — WOOD, PLASTICS AND COMPOSITES Section: 06 12 00 — Structural Panels	REPORT HOLDER: ZS2 TECHNOLOGIES, LTD.	EVALUATION SUBJECT: ZS2 TECHPANEL STRUCTURAL INSULATED PANELS (SIPs)	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024 and 2021 *International Building Code*® (IBC)
- 2024 and 2021 *International Residential Code*® (IRC)

Property evaluated:

- Structural
- Thermal Barrier
- Fire Resistance

2.0 USES

ZS2 TechPanel Structural Insulated Panels (SIPs) are used as load-bearing wall, floor, and roof panels in fire-resistive and non-fire-resistive Type V construction. When panels are installed under the IRC, an engineered design is required in accordance with IRC Section R301.1.1.3.

3.0 DESCRIPTION

3.1 General:

ZS2 TechPanel SIPs are factory-laminated sandwich panels consisting of magnesium oxide board facings with an expanded polystyrene (EPS) foam plastic core. Panels are minimum 6.5 inches thick (165 mm) and a maximum of 4 ft (1219 mm) wide and 10 ft (3048 mm) tall.

3.2 Material:

3.2.1 Facing: The facing material is nominally 0.47-inch-thick (12 mm) Magnesium Oxide panel certified in accordance with ICC-ES Acceptance Citeria for Foam Plastic Insulation (AC386).

3.2.2 Expanded Polystyrene: The EPS foam plastic core certified in accordance with ICC-ES Acceptance Citeria for Foam Plastic Insulation (AC12), complies with ASTM C578, Type I. The EPS foam plastic has a flame-spread index not exceeding 25 and a smoke-developed index not exceeding 450 when tested in accordance with ASTM E84. The core is supplied in nominal thickness of 5.5 inches (140 mm).

3.2.3 Adhesive: The adhesive used for laminating the SIPs is certified in accordance with ICC-ES Acceptance Citeria for Sandwich Panel Adhesives (AC05), complies with Type II Class 2 performance requirements.

3.2.4 Splines: ZS2 SIPs use nominal 2x6 #2 SPF double lumber splines. The lumber members are connected to each other using a minimum of 3 in. x 0.120 Smooth Shank Nails in 2 rows 8-1/2 inch on center with the rows 1-3/8 inch from the lumber edge.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The scope of this report is limited to the evaluation of the Structural Insulated Panel component. Panel connections and other details related to incorporation of the product into the overall structural system of a building are beyond the scope of this report.

4.1.2 Design Approval: Where required by the authority having jurisdiction, structures using SIP 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, are submitted to the code official for approval 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.

4.1.3 Design Loads: Design loads to be resisted by the SIPs shall be as required under the applicable code. The design loads on the panels shall not exceed the allowable loads noted in this report. Calculations demonstrating that the design loads applied are less than the allowable loads described in this report shall be submitted to the code official for approval.

4.1.4 Allowable Loads: Allowable axial, transverse and in-plane shear loads are provided in Tables 1 through 3. For loading conditions not specifically addressed herein, structural members designed in accordance with accepted engineering practice shall be provided to meet applicable code requirements.

4.1.5 Eccentric and Side Loads: For wall panels, the axial loads shall be applied concentrically to the top of the wall panels.

4.1.6 Openings: Openings in SIPs are beyond the scope of this report. When openings in the SIPs are used, the openings shall be framed with framing members designed in accordance with accepted engineering practice to resist all loads applied around the opening, as required by the applicable code. Details for door and window openings shall be provided to clarify the manner of supporting axial, transverse and/or in-plane shear loads at openings. Such details shall be subject to approval by the local authority having jurisdiction.

4.1.7 In-Plane Shear Design: Shear walls utilizing lumber splines shall be sized to resist all code required wind and seismic loads without exceeding the allowable loads provided herein. 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.

4.1.8 Seismic Design Categories A, B, and C: Use of the shear wall configurations in Table 3 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; System Overstrength Factor, Ω_0=2.5; Deflection Amplification Factor, C_d=2.0. The maximum panel height-to-width ratio shall be as specified in Table 3.

4.1.9 Combined Loads: Where loading conditions result in superimposed stresses, the sum of the ratio of actual loads over allowable loads shall not exceed one.

4.2 Installation:

4.2.1 General: ZS2 TechPanel Structural Insulated Panels, described in this report, shall be fabricated, identified, and erected in accordance with this report, the approved construction documents, and the applicable codes. 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.

4.2.2 Splines: Structural Insulated Panels are interconnected at the panel edges through the use of a double lumber spline complying with Section 3.2.4. The spline shall be secured to the facing using 2-1/2 inch x 0.094 inch (63.5 mm x 2.4 mm) ring shank nails spaced 3 inches on center. One row on each side of the spline connection on both sides of the panel.

4.2.3 Framing: Structural Insulated Panels shall have a double lumber top plate consisting of #2 SPF 2x nominal lumber interconnected using a minimum of 3 inch x 0.120 inch (76 mm x 3 mm) Smooth Shank Nails

in 2 rows 8-1/2 inch (216 mm) on center with the rows 1-3/8 inch (35 mm) from the lumber edge. Panels use a minimum single #2 SPF 2x nominal lumber bottom plate. Panel ends shall have a minimum single #2 SPF 2x nominal lumber member.

4.2.4 Cutting and Notching: No field cutting or routing of the panels shall be permitted except as shown on approved construction documents.

4.2.5 Protection from Decay: The panels must be installed such that the panel facings are protected against decay and termites in accordance with 2024, 2021 IBC Sections 2304.12.1.2 and 2304.12.1.5 and 2024 IRC Section R304 and R305 and 2021 IRC Sections R317 and R318 as applicable.

4.2.6 Protection from Termites: Use of foam plastic in areas subject to damage from termites must be in accordance with 2024, 2021 IBC Section 2603.8 and 2024 IRC Section 305.4 and 2021 IRC Section R318.4 as applicable.

4.2.7 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. This limitation shall not be interpreted to prohibit heat-producing elements with suitable protection.

4.2.8 Plumbing Installation Restrictions: Plumbing and waste lines may extend at right angles through the wall panels but are not permitted vertically within the core. Lines shall not interrupt splines or panel plates unless approved by a registered design professional. Opening shall be designed in accordance with Section 4.1.7.

4.2.9 Electrical Installation Restrictions: Electrical outlet boxes and raceways may be installed in the panels during fabrication at predetermined locations only. Structural Insulated Panels have shop installed vertical raceways measuring 1-1/4 inch (32 mm) located centered half-way between spline connections. No more than three outlet box openings 4 inches by 4 inches (102 mm x 102 mm) in size may be along each raceway. Horizontal raceways measuring 1-1/4 inch (32 mm) may be located 16 inches (406 mm) and 48 inches (1219 mm) from one end of the panel.

4.2.10 Panel Cladding:

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

4.2.10.2 Exterior Wall Covering: Panels must be covered on the exterior by a code-compliance 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.

4.2.10.3 Interior Finish (Thermal Barrier): The structural Insulated Panel assembly meets the requirements of IBC Section 2603.9 and 2024 IRC Section R303.6 (2021 IRC R316.6) when tested in accordance with NFPA 286 and does not require an additional thermal barrier when installed in accordance with this report and the manufacturer's installation instructions.

4.3 Fire-resistance-rated Construction:

4.3.1 Two-hour non-load-bearing Wall Assembly: TechPanel SIPs with a thickness of 6-1/2 inches (165 mm) are used to construct a two-hour non-load-bearing fire-resistance rated assembly. The SIP core is recessed 1-1/2 inches (38 mm) from the SIP bottom and sides. The SIP core is recessed 3 inches from the SIP SIP top. The recesses receive nominal 2-by spruce-pine-fir No. 2 or better lumber (single bottom and sides, double top) with a depth to match the core thickness. The plates must be connected to the SIPs by fastening through the SIP MgO facing with 16 ga staples with ½ inch crown (12.7 mm) and 1-1/2 inch legs (38 mm) 3 inches (76 mm) on center, one row in each lumber member, both sides of the SIP. The SIP splines consist of two 2-by spruce-pine-fir No. 2 or better lumber as assembled and attached as specified in Section 4.2.2. A 3/8 inch (9.5 mm) bead of Titebond All Weather Subfloor adhesive from Franklin International is applied to both edges of each stud and plate before inserting between the facings and attaching.

A layer of MgO sheathing complying with ESR-4586 was attached to the SIP facer, with the seams offset 24 inches (610 mm) from the panel splines. The layer of MgO sheathing is attached to the SIP facer using 16 ga. steel staples ½ inch (12.7 mm) crown-width and 2 inch (51 mm) legs, 3 inches (76 mm) on center around the perimeter. The MgO sheathing joints must be filled with Hilti CFS-S SIL GG Firestop Silicone to fill the 1/16 to 1/8 inch (1.6 to 3.2 mm) gap.

5.0 CONDITIONS OF USE:

The TechPanel Structural Insulated Panels described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The structural Insulated Panels are fabricated, identified, and erected in accordance with this report and the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions, the more restrictive governs.

5.2 Design loads to be resisted by the Structural Insulated Panels must be determined in accordance with the IBC or IRC as applicable and must not exceed the allowable loads noted in this report.

5.3 All construction documents specifying the Structural Insulated Panels must comply with the design limitations of this report. Design calculations and details for the specific applications must be furnished to the code official, verifying compliance with this report and applicable codes. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 Connections and attachments of the Structural Insulated Panels to the supporting elements are outside the scope of this report and must be addressed in the design calculations and details.

5.5 The transfer of vertical and lateral loads from the roof or floor diaphragm into the shear wall and from the shear wall to the foundation must be addressed in the calculations.

5.6 When SIPS are used as shear walls, calculations and details showing the load path for the transfer of lateral forces from the shear walls to the foundation must be submitted to the code official.

5.7 Wood elements must be installed as set forth in IBC Section 2304.12.1 or 2021 IRC Section R304 and R305 (2021 IRC Section R317).

5.8 Structural Insulated Panels for Roof and Floor Panel installation requires a support condition with a minimum of 1.5 inches (38.1 mm) bearing length on each end of the panel.

5.9 When used as shear walls, Structural Insulated Panels are recognized for use in Seismic Design Categories A, B, and C. Use of the panels as shear walls for buildings in Seismic Design Categories D through F, is outside the scope of this report.

5.10 The panels are fabricated under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Sandwich Panels (AC04), dated June 2019 (Editorially revised August 2024).

6.2 Report of tests conducted in accordance with ASTM E119.

6.3 Report of a room corner fire test conducted in accordance with NFPA 286.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5346) along with the name, registered trademark, or registered logo of the report holder must be included in the product label. Panels shall bear the company name and address and evaluation report number.

7.2 The report holder's contact information is the following:

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TABLE 1—ALLOWABLE TRANSVERSE LOAD FOR TECHPANEL™ [1,2,3,4,5,6]

NOMINAL SIP THICKNESS (in.)	SIP WALL HEIGHT (ft)	L/120	L/180	L/240	L/360
6 1/2	10	81.7	81.7	81.7	65

For SI: 1 inch = 25.4 mm, 1 ft = 304.8 mm, 1 psf = 4.88 kg/m^2

[1]SIPs must be single span
[2]Values are based on end supported panels with no bearing area on the panel facings.
[3]Tabulated allowable transverse load is the maximum load (pounds per square foot) applied uniformly.
[4]The tabulated allowable transverse load is the lesser of the allowable load based on the applicable serviceability (deflection) limit (IBC Section 1604.3) or the strength limit (IBC Section 1604.2) using a factor of safety of three.
[5]Where maintenance worker roof live load of 300 lbf us required under the IBC, the allowable spans must be determined by a registered design professional.
[6]Values do not include dead weight of panels. Permanent loads, such as dead load must not exceed 0.5 of the tabulated load.

TABLE 2—ALLOWABLE AXIAL LOAD FOR TECHPANEL™ [1,2]

NOMINAL SIP THICKNESS (in.)	SIP WALL HEIGHT (ft)	Allowable Axial Load (plf)
6 1/2	10	3586

For SI: 1 inch = 25.4 mm, 1 ft = 304.8 mm, 1 plf = 14.59 N/m

[1]Tabulated allowable axial load is the maximum uniform load (pounds per linear foot) applied concentrically to the full thickness of the SIP, including facings, to the top. Eccentric axial loading to one face of the SIP is outside the scope of this report. The base of the SIP must be fully bearing, including facings, on structural supports.
[2]For combined loading, the requirements in Section 4.1 must be applied.

TABLE 3—ALLOWABLE LATERAL IN-PLANE RACKING SHEAR LOAD FOR TECHPANEL™ [2,3,4,5]

NOMINAL SIP THICKNESS (in.)	Aspect Ratio	Spline Type	Bottom Plate	Top Plate	End Posts	Nail Type	Nail Spacing	Allowable Load (plf)[1]
6 1/2	1:1	Double #2 SPF 2x6 Lumber	Double #2 SPF 2x6 Lumber	Double #2 SPF 2x6 Lumber	Double #2 SPF 2x6 Lumber	2-1/2 inch x 0.094 inch Ring Shank Nails complying with ASTM F1667	3 inch on center, one row centered in each lumber member	501
	1.25:1							607
	2:1							562

For SI: 1 inch = 25.4 mm, 1 plf = 14.59 N/m

[1]Top-of-wall horizontal in-plane drift (deflection) of shear wall assemblies is 1/8 inch at the tabulated allowable lateral load.
[2]End posts and splines must be framed to provide full end bearing in accordance with IBC Section 2304.9.7. A hold-down device must be attached to the vertical studs at each end of the shear wall assembly. Installation of the hold-down devices must be in accordance with the hold-down device manufacturer's instructions and as designed by the registered design professional.
[3]Splines must be as described in Section 3.2.4 of this report.
[4]The minimum fastener edge distance is ¾ inch. Nails shall be installed on both sides of the panel with a single row centered in each lumber framing member (top plates, bottom plates, end plates, and spline) of the SIP shearwall.
[5]Installations are recognized for use in Seismic Design Categories A through C, at the aspect ratios specified.

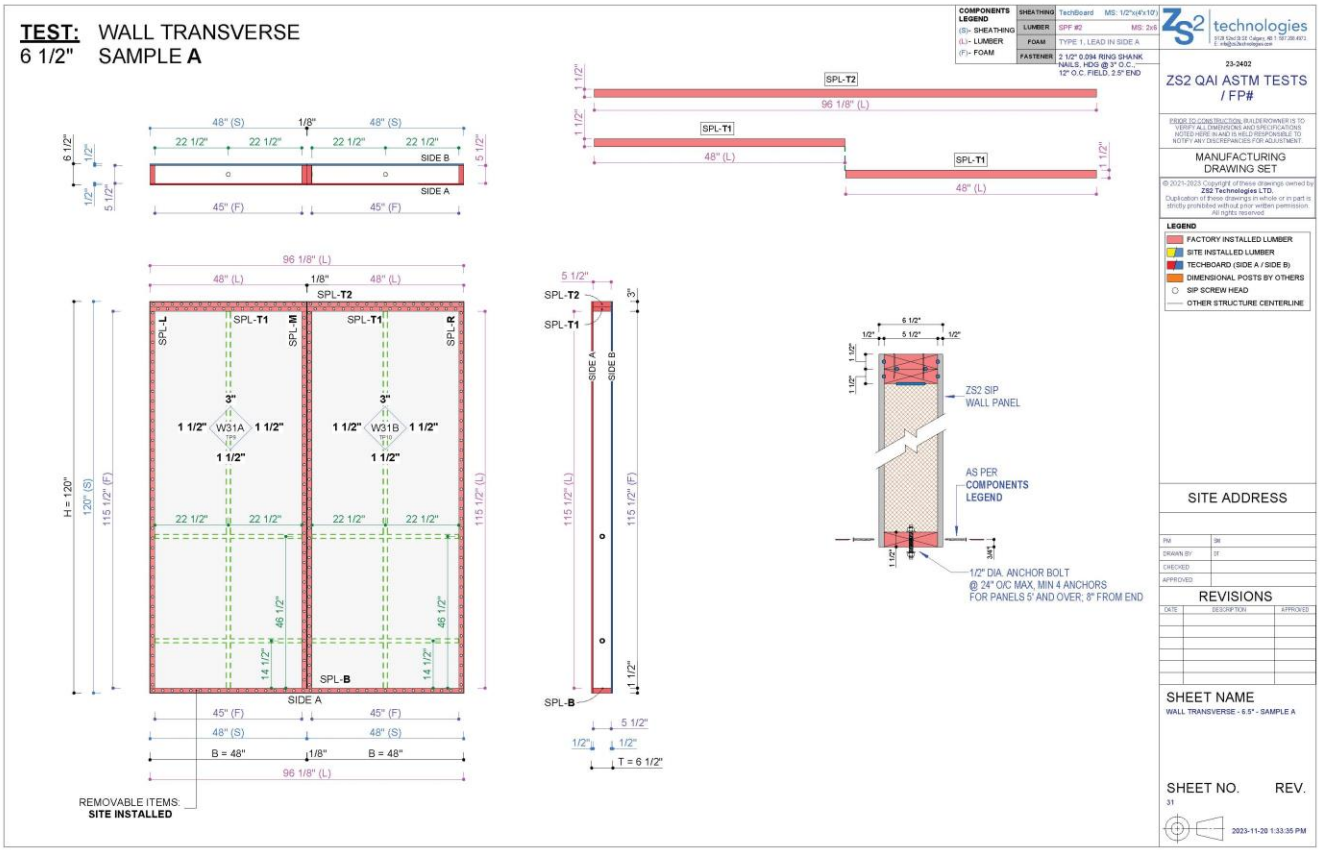

FIGURE A—STANDARD WALL CONSTRUCTION, DOUBLE LUMBER SPLINE AND TOP PLATE, SINGLE LUMBER END POST AND BOTTOM PLATE

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 12 00—Structural Panels

REPORT HOLDER:

ZS2 TECHNOLOGIES, LTD.

EVALUATION SUBJECT:

ZS2 TECHPANEL STRUCTURAL INSULATED PANELS (SIPs)

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that ZS2 TechPanel Structural Insulated Panels, described in ICC-ES evaluation report ESR-5346, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The ZS2 TechPanels, described in Sections 2.0 through 7.0 of the evaluation report ESR-5346, comply with the LABC Chapters 7, 23 and 26, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The ZS2 TechPanels, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-5346.
- The design, installation, conditions of use and identification of the ZS2 TechPanels are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-5346.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted. The ZS2 TechPanels may be used in the construction of new buildings located in and Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area, provided installation is in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of Sections 701A.3, 705A and 707A of the LABC, as applicable.
- The ZS2 TechPanels may be used in the construction of new buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area, provided installation is in accordance with the 2021 *International Residential Code®* (IRC) provisions noted in the evaluation report and the additional requirements of Sections R337.1.3, R337.5 and R337.7 of the LARC, as applicable.

The products have not been evaluated for compliance with the *International Wildland-Urban Interface Code®.*

This supplement expires concurrently with the evaluation report, issued February 2025.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 12 00—Structural Panels

REPORT HOLDER:

ZS2 TECHNOLOGIES, LTD.

EVALUATION SUBJECT:

ZS2 TECHPANEL STRUCTURAL INSULATED PANELS (SIPs)

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that TechPanel Structural Insulated Panels, described in ICC-ES evaluation report ESR-5346, have also been evaluated for compliance with the code*(s)* noted below.

Applicable code edition(s):

- 2022 *California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2022 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The ZS2 TechPanels, described in Sections 2.0 through 7.0 of the evaluation report ESR-5346, comply with CBC Chapters 7, 16 and 26, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16 and 26, as applicable.

ZS2 TechPanels may be used in the construction of new buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area, provided installation is in accordance with the 2021 *International Building Code*® (IBC) Provisions noted in the evaluation report and the additional requirements of Sections 701A.3, 705A and 707A of the CBC as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The ZS2 TechPanels, described in Sections 2.0 through 7.0 of the main evaluation report ESR-5346, are in compliance with CRC Chapters R301 and R316, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the main report and the additional requirements of CRC Sections R301 and R316 as applicable.

ZS2 TechPanels may be used in the construction of new buildings located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area, provided installation is in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the evaluation report and the additional requirements of Sections R337.1.3, R337.5 and R337.7 of the CRC, as applicable.

The products included in this supplement have not been evaluated for compliance with the *International Wildland–Urban Interface Code*®.

This supplement expires concurrently with the evaluation report, issued February 2025.

DIVISION: 06 00 00 — WOOD, PLASTICS AND COMPOSITES
Section: 06 12 00 — Structural Panels

REPORT HOLDER:

ZS2 TECHNOLOGIES, LTD.

EVALUATION SUBJECT:

ZS2 TECHPANEL STRUCTURAL INSULATED PANELS (SIPs)

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that ZS2 TechPanel Structural Insulated Panels (SIPs), described in ICC-ES evaluation report ESR-5346, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The ZS2 TechPanel Structural Insulated Panels (SIPs), described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-5346, complies with the *Florida Building Code — Building.*, The design requirements must be determined in accordance with the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-5346 for the 2021*International Building Code*® meet the requirements of the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable, with the following conditions:

- Installation of the foam plastic in areas subject to damage from termites must meet the requirements of Sections 1403.8 and 2603.8 of the *Florida Building Code—Building* and Sections R318.7 and R318.3 of the *Florida Building Code—Residential*, as applicable.

Use of the ZS2 TechPanel Structural Insulated Panels (SIPs) have also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code-Building* or the *Florida Building Code-Residential*. The allowable positive or negative design wind load must not exceed the allowable transverse loads noted in Table on of ESR-5346.

In addition to the data noted in Section 6.0 of the evaluation report ESR-5346, data in accordance with Florida Building Code Test Protocols for High-Velocity Hurricane Zones, TAS 201, TAS 202 and TAS 203 was submitted.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, issued February 2025.