PHIUS CERTIFIED

Manufacturer Name: **GUARDIAN STRUCTURAL TECHNOLOGIES**

Product Name: **SHIELD™ Panels**

Building Type Application

- ☑ Single Family
- ☑ Multifamily
- ☑ Non-Residential

Verification Requirements

Grading Key

- Pass
- Not Included
- Improvement Needed
- Partial / Pending

Thermal Performance

Building America Zones		IECC Zones
Subarctic		8
Very Cold		7
Cold	✓	5 & 6
Mixed-Humid	✓	3A & 4A above warm-humid line
Marine	✓	"C" Moisture Regime
Hot-Dry / Mixed - Dry	✓	1B, 2B, 3B & 4B
Hot-Humid	✓	1A, 2A & 3A below warm-humid line

Climate Recommendations

Valid through September 2025

Certification Report, Building/Panel System Valid through September 2025

Name of Manufacturer: Guardian Structural Technologies

Company Website: www.guardianstructural.com

Name of Product system: SHIELD™ Panels

Product Description

"The GUARDIAN STRUCTURAL TECHNOLOGIES building system is a fully engineered, highly insulated, structural building envelope designed to meet or exceed all major building codes. This building system integrates light gauge galvanized steel and expanded polystyrene (EPS), which provides complete wall or roof sub-systems. This technology has been in use for over 20 years and has provided unprecedented energy efficiency, tremendous design flexibility and a substantially stronger structure than conventional framing.

Sustainable – components made from 100% recyclable material.
Healthy – panels do not let off toxic gases and do not mold or attract pests.
Insulated – provide R Values of up to R-50.
Energy-Efficient – reduces heating and cooling costs for life of structure.
Load-Bearing – engineered-stamped to ensure true structural integrity.
Durable – panels never break down."

Submitted by: Steve DiMaria – Engineering Manager, Marc Crudele – Development Manager

Location of Final Manufacturing Facility: Cleveland, Ohio, USA

Certification Requirements & Evaluations

1. Water Control

Criteria / Requirements	Evaluation
Water control system is conceptually sound. Cladding and roofing materials are either 1) Included in the scope of prefabrication, 2) Included as a kit of separate materials to be attached on-site, or 3) Specified in generic terms in the application instructions for the system, to be specified in detail and acquired separately by building project teams.	Follows option 3 – cladding / roofing is not within the scope of the product system itself. Page 9 of the Installation Guidelines document says, "Along with proper flashing and taping procedures weather-resistive barriers or drainage planes shall be used on all vertical surfaces of the SHIELD™ PANELS installed as per manufacturers specifications. DELTA®-VENT S is recommended…"
If the scope of the product system's application includes residential construction, the system meets all applicable provisions of the ENERGY STAR Certified Homes Version 3 Water Management System Builder Requirements.	The Energy Star requirements document is included on a list of Installation Standards on page 2 of the Installation Guidelines document.
Application instructions include guidance on the kinds of cladding and roofing with which the system is intended to be compatible.	The GST 3-part Specification contains these sections: 1.9 Project Conditions (E) "Application of sealants, primers, elastomeric coatings, brick stone facing, or any other form of interior or exterior finishes to GUARDIAN STRUCTURAL TECHNOLOGIES building system shall be done under the conditions set forth by the fabricator of those products." 2.2 Materials (F) "Weather-resistant barriers along with proper flashing and taping procedures shall be used on all vertical surfaces of the GST building system. Weather-resistant barriers and components shall be supplied or recommended by GST." 3.4 Protection (D) "Weather-resistant barriers along with proper flashing and taping procedures shall be used on all vertical surfaces of the GST building system to prevent water intrusion from the exterior, while allowing wetness from inside the structure to escape through the wall and diffuse to the outside."

2. Air Control

Criteria / Requirements	Evaluation
There is a continuous primary air barrier.	
1. Clearly identify all air barrier components of each envelope assembly on construction	Though not called out as such, the foam insulation clearly serves as the primary air

Criteria / Requirements	Evaluation
documents and detail the joints, interconnections, and penetrations of the air barrier components.	barrier. Sealing of the joints and interconnections is addressed.
2. Join and seal the air barrier materials of each assembly to the air barrier materials of adjacent assemblies, allowing for the relative movement of these assemblies and components. Clearly identify air barrier system continuity on the plan and section construction drawings.	Though not called out verbosely on the drawings, the air barrier continuity concept is clear. The sealant manufacturer claims, "The non-rigid, highly elastic formula will not bow windows & doors, provides an air- and water-tight seal and allows up to 30% joint movement."
3. Provide details to seal all penetrations of the air barrier assembly, including but not limited to electrical, plumbing and HVAC components, windows and doors, and compatibility of materials with one another.	Windows and doors are addressed but there are no details for penetrations for electrical, plumbing, and HVAC. Compatibility of materials is addressed in the 3-part Specification document clause 2.2 G, "adhesives, caulks, and sealants … shall be supplied or recommended by GST."
4. Support the air barrier so that it shall withstand the maximum positive and negative air pressures that will be placed on the building without displacement or damage. Forces due to pressure differences are transferred to the structure. The air barrier assembly must be durable to last the anticipated service life of the envelope.	The air barrier is integral with the structure.
Application instructions for the system must include advice to meet these additional provisions[1]: •Provide a motorized damper in the closed position and connect it to the fire alarm system to open on call and fail in the open position for any fixed open louvers such as at elevator shafts. Dampers and controls shall close all ventilation or make-up air intakes and exhausts, atrium smoke exhausts and intakes, etc., where leakage can occur during inactive periods. Garages under buildings shall be compartmentalized by providing airtight vestibules at building access points. Provide airtight vestibules at building entrances with high traffic. •Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.	Incorporated by reference

[1] U.S. Army Corps of Engineers Air Leakage Test Protocol for Building Envelopes, version 3, section 2.1, items 5 and 6.

3. Water Vapor Control

Criteria / Requirements	Evaluation
The building / panel system's main assemblies must be low-risk for moisture problems. There are three compliance paths.	Passes by prescriptive rules. "The EPS cores of the metal SIPs provide their own vapor control layers and require no additional vapor-diffusion control in any climate."

4. Thermal Control

Criteria for Suitability by Climate Zone

Zone	Minimum Surface Temperature Factor		Minimum Wall / Roof R-value (IP)		Minimum Foundation Insulation (against ground)		Minimum Window Condensation Resistance	
Subarctic	0.73	☑	60 / 80		Whole slab R-40		0.74	
Very Cold	0.70	☑	55 / 75		Whole slab R-30		0.67	
Cold	0.69	☑	40 / 65	☑	Whole slab R-20		0.63	
Mixed-Humid	0.67	☑	25 / 50	☑	2 ft. R-20 vertical perimeter		0.56	
Marine	0.72	☑	24 / 45	☑	4 ft. R-20 vertical perimeter		0.54	
Mixed-Dry / Hot-Dry	0.57	☑	18 / 40	☑	No minimum		0.63	
Hot-Humid	N/A	☑	12 / 30	☑	No minimum		0.57	

Main assembly R-values

Assembly	Effective R / U value	
	h.ft2.F/Btu	W/m2.K
Wall, 9.25 inch / 235 mm	34	0.168
Wall, 11.25 inch / 286 mm	41	0.138
Roof, 12 inch / 305 mm	45	0.127
Roof, 15 inch / 381 mm	55	0.103
Roof, 18 inch / 457 mm	66	0.0861
Floor	N/A	N/A

Performance Ratings of Connection Details

Connection type	Surface Temperature Factor	Linear thermal bridge coefficient (ref. to exterior dimensions)	
		Btu/h.ft.F	W/m.K
Plan views:			
Wall corner, exterior	0.89	-0.027	-0.047

Connection type	Surface Temperature Factor	Linear thermal bridge coefficient (ref. to exterior dimensions)	
		Btu/h.ft.F	W/m.K
Wall corner, re-entrant	0.94	0.018	0.031
Window/door jamb	0.79	0.038	0.066
Wall panel, vertical joint	0.94	0.001	0.002
Wall at interior wall	0.94	0.000	0.000
Section views:			
Foundation perimeter			
Uncond. Basement ceiling at exterior wall			
Uncond. Basement ceiling at interior wall			
Cond. Basement wall to uncond. basement ceiling			
Cond. Basement floor to uncond. Basement wall			
Cond. Basement floor to cond. Basement wall			
Floor slab to cond. Basement wall			
Floor slab to interior wall			
Door sill			
Parapet	0.94	-0.036	-0.062
Roof to wall above – Wooden beam below	0.95	0.019	0.033
Roof to wall above – I-beam below	0.98	0.015	0.026
Overhanging floor to wall above			
Exterior wall at ceiling / rim joist	0.91	0.021	0.036
Eave	0.86	-0.006	-0.010
Skylight sill			
Skylight head			
Skylight jamb/curb			
Roof ridge/ hip	0.86	-0.016	-0.028
Roof valley			
Roof rake	0.87	-0.011	-0.019
Roof to interior wall			
Window head	0.79	0.038	0.066
Window sill	0.79	0.038	0.066
Wall to overhang above			

5. Critter Control

Criteria / Requirements	Evaluation
Insect control at: overhanging floor at outside corner, wall-to-foundation, deck connection to base of wall.	Not within the scope of the system.
Corrosion-proof rodent/bird screens installed at all openings that cannot be fully sealed, with the exception of dryer vents.	Requirement referenced in the installation manual.

6. Health / Indoor Air Quality

Criteria / Requirements	Evaluation
System complies with Section 6 of EPA Indoor airPLUS Version 1 Construction Specifications for Composite Wood, Interior Paints and Finishes, Carpets and Carpet Adhesives.	There are no such materials within the scope of the product system.
6.1 Composite Wood	Not applicable
6.2 Interior Paints and Finishes	Not applicable
6.3 Carpets and Carpet Adhesives	Not applicable
Builder's manual calls for finishing the building in compliance with said specifications, and voids warranty otherwise.	Incorporated by reference. Because finishes are out of scope, the warranty requirement is waived.

7. Sustainability Assessments or Certifications

Criteria / Requirements	Evaluation
The blowing agents for any extruded polystyrene or spray polyurethane foam products used over broad areas in assemblies must be disclosed, and necessary calculations performed using the PHIUS Insulation Global Warming Potential Calculator. Products used only in spot or linear patterns such as door installation and rim joists are exempt from this requirement.	There is no extruded polystyrene. Spray foam is used only in linear patterns as a sealant.
The product system must select one of a number of sustainability assessments or certifications to pursue and obtain by 31 July 2022	Path forward is ILFI DECLARE. The product system has a Red List product declaration form from 2014, but is not current listed. Industry-Association type Environmental Product Declarations were also submitted for: • EPS Insulation (4787238561.101.1), • Cold-Formed Steel Studs and Track manufactured in U.S. and Canada (SCS-EPD-03838), and • Spray polyurethane foam insulation (HFO) (EPD-085) However, the MSDS for the foam sealant indicates blowing agent is not HFO but dimethyl ether, isobutane, and propane.

Manufacturer's Additional Test Data

• ASTM A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

• ASTM A 500 Standard Specifications for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

• ASTM A 513 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

• ASTM A653/A653M-07 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

• ASTM A787-05 Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing

• ASTM C36/C36M-03 Standard Specification for Gypsum Wallboard

• ASTM C203-05a Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation

• ASTM C272-01(2007) Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions

• ASTM C303-07 Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation

• ASTM C518-04 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

• ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

• ASTM D1621-04a Standard Test Method for Compressive Properties of Rigid Cellular Plastics

• ASTM E72-05 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

• ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

• ASTM E90-04 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

• ASTM E96/E96M-05 Standard Test Methods for Water Vapor Transmission of Materials

• ASTM E119-08a Standard Test Methods for Fire Tests of Building Construction and Materials

• ASTM E2226 - 08 Standard Practice for Application of Hose Stream