CODE EVALUATION REPORT

CERUS-1047

PUBLISHED: April 2025
EXPIRATION: April 2027

PRODUCT(s): **Ergosun Integrated Solar Tiles**

REPORT HOLDER: Ergosun Holdings, LLC

CONTACT DETAILS:
428 Westcor Drive,
Coralville, IA
52241 USA

CSI DIVISIONS: 07 00 00 – Thermal and Moisture Protection

CSI SECTION: 07 32 00 – Roof Tiles

APPLICABLE CODES:
2021, 2018 International Building Code (IBC)
2021, 2018 International Residential Code (IRC)
2023, 2020 Florida Building Code (FBC)

EVALUATED:
Weather Resistance.
Wind Resistance.
Roof Fire-Classification.
Properties of Plastics.

IAS ACCREDITED Product Certification Agency PCA-118

1.0 APPROVED FOR FOLLOWING:

APPROVED TYPES OF CONSTRUCTION:	Type I-V/ AB
APPROVED USE:	Roof coverings for use in Class A fire-classified assemblies.
APPROVED INSTALLATIONS:	Roofs including fire-classified roof assemblies.

2.0 DESCRIPTION:

2.1 General:

Ergosun Integrated Solar Tiles are roof tiles consisting of a photovoltaic (PV) module installed onto a compliant concrete roof tile for use on slopes ≥ 2-1/2 :12 (21%). Ergosun Integrated Solar tiles are available in three different model types: Ergosun 17.5W Black, Ergosun 15W Black, and Ergosun 15W Sedona Red. When installed in accordance with Section 4.4 and Table 4 of this report, Ergosun Integrated Solar Tile products provide a Class A roof-fire assembly determined in accordance with Section 1505 of the 2021 / 2018 IBC and Section R902.1 of the 2021 / 2018 IRC.

Ergosun 17.5W Black, Ergosun 15W Black, and Ergosun 15W Sedona Red Integrated Solar Tiles are evaluated for wind uplift when installed in accordance with this report. The tiles comply as building-integrated photovoltaic (BIPV) roof panels listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) accredited by the Occupational Safety and Health Administration (OSHA), SolarPTL, LLC as required by the 2021 IBC Section 1507.17, 2018 IBC Section 1507.18 and 2021 / 2018 IRC Section 905.17.

Plastic components used in Ergosun Integrated Solar Tiles have a spontaneous ignition temperature ≥ 650°F (343°C) when tested to ASTM D1929, have a smoke density <75% when tested to ASTM D2843 and are classified as minimum CC2 when tested to ASTM D635.

Ergosun Integrated Solar Tile products comply for use as roof coverings per the 2023 / 2020 Florida Building Code (FBC) including for use in areas defined as high velocity hurricane zones (HVHZ). See Section 10 of this report for further details.

2.2 Products:

2.2.1 Ergosun Integrated Solar Tiles:

See Table 1 below for the properties of the recognized models of Ergosun Integrated Solar Tiles.

Table 1 – Ergosun Integrated Solar Tile Properties

Product	Length		Width		Installed Weight		Installed Exposure	
	Inches	mm	Inches	mm	lbs/sqft	kg/m^2	Inches	mm
Ergosun 17.5W Black,	17	432	13	330	9.4	46	11-3/4	335
Ergosun 15W Black	17	432	13	330	9.4	46	11-3/4	335
15W Sedona Red	17	432	13	330	9.4	46	11-3/4	335

3.0 DESIGN:

Ergosun Integrated Solar Tile products outlined in this report comply with performance requirements outlined in Section 1504 of the 2021 / 2018 IBC and 2023 / 2023 FBC Section 1504, including compliance with concrete tile requirements ASTM C1492 as required by 2021 / 2018 IBC and 2023 / 2020 FBC Section 1507.3.5. Ergosun Integrated Solar Tiles are to be installed on roofs with minimum slopes of 2-1/2:12 (21%).

Where installed in accordance with Table 2 of this report Ergosun Integrated Solar Tiles are limited to applications to maximum allowable uplift pressures listed in Table 3 of this report. Use in applications greater than those stated require approval by a registered design professional and approval by the authority having jurisdiction.

Ergosun Integrated Solar Tiles are intended for use as the finished roof covering on new and over existing construction where existing roof coverings have been removed in accordance with Section 4.2 and 4.3 of this report as applicable. When used in applications requiring roof fire classified assemblies, installation shall conform to Section 4.4 and Table 4 of this report.

4.0 INSTALLATIONS:

4.1 General:

Installation of Ergosun Integrated Solar Tiles must comply with the manufacturer's published installation instructions, this report, and the applicable code(s). Where differences are found, this report and the applicable building code shall be followed.

Ergosun Integrated Solar Tiles require installation onto 2-inch by 2-inch (38 mm x 38 mm) wood battens over plywood of minimum 15/32-inch (12 mm) thickness complying with the applicable code. Battens are attached using fasteners with size and spacing complying with the applicable code and of sufficient length to penetrate the framing at least 1-inch (25 mm) depth. Each tile is fastened to battens using two (2) No. 8 by 2-1/2-inch (64 mm) length corrosion resistant screws at preformed holes on tiles. Attachment of the sheathing and battens to underlying framing elements is outside the scope of this report and shall be sufficient to resist service loads.

Ergosun Integrated Solar Tile products are intended for installation onto minimum 2-1/2:12 (21%) roof slopes.

Flashing, counterflashing, and valley flashing shall be sheet metal complying with the applicable code. Sheet metal must be G90 galvanized of minimum 0.0179 inches (0.455 mm) uncoated thickness. Valley flashing shall be a minimum 15 inches (381 mm) wide sheet metal of minimum 0.0179 inches (0.455 mm) uncoated thickness. Flashing, including fasteners, shall not be in contact with dissimilar metals to avoid corrosion. Flashing shall prevent moisture from entering the wall and roof in accordance with Section 1503.2 of the 2021 / 2018 IBC and Section R903.2 of the 2021 / 2018 IRC.

While not required, drip edge flashings and rake edge flashings are recommended, installed with good roofing practice.

4.1.1 Special Inspection:

2021 IBC Section 1705.12: Special inspection including periodic special inspection for wind resistance are required for buildings constructed in the following areas:

1. Wind Exposure Category B, where V_{Ult} is ≥ 150 mph (241 km/hr).
2. Wind Exposure Category C or D, where V_{Ult} is ≥ 140 mph (225 km/hr).

Special inspection is to confirm installation is in conformance with Section 8.1 of this report. Installation in areas of maximum V_{Ult} of 130 mph (209 km/hr), maximum mean roof height of 40 ft (12.2 m) and Exposure Category B do not require special inspection.

4.1.2 Underlayment:

Underlayment must comply with and be installed in accordance with 2021 / 2018 IBC Sections 1507.1.1 and 1507.16.3 and 2021 / 2018 IRC Sections R905.1.1 and R905.15.3 as applicable. For fire-classified roof assemblies, underlayment shall be installed in accordance with Table 4 and Section 4.4 of this report. Underlayment must comply with and be installed in accordance with the applicable code and the manufacturer's published installation instructions.

In areas where there is potential for or has been a history of ice forming along eaves causing the backup of water an ice barrier is required. The ice barrier may consist of:

a) Two layers of ASTM D226 Type I, ASTM D4869 Type I or ASTM D6757 underlayment cemented together or
b) A self-adhering polymer modified bitumen sheet complying to ASTM D1970.

Alternate ice barriers are outside the scope of this report but may be used where approved by the authority having jurisdiction. The ice barrier shall be used as an alternative to the normal underlayment, extending from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the structure. Following, the standard underlayment shall be lapped over the ice barrier and shall overlap a minimum of 4 inches (102 mm). Attachment and overlapping of the ice barrier to underlayment are outside the scope of this report and is to be in accordance with the applicable code and the ice barrier manufacturer's published installation instructions.

4.2 New Construction:

Ergosun Integrated Solar Tiles are to be installed on wood battens spaced 13-3/4 inches (350mm) OC, over minimum 15/32-inch (12 mm) thickness plywood complying with the applicable code. Wood battens are to be minimum nominal 2-by-2 (38 mm x 38 mm) in size. Battens are attached using fasteners with size and spacing complying with the applicable code and of sufficient length to penetrate the framing at least 1-inch (25 mm) depth

4.3 Reroofing Applications:

Ergosun Integrated Solar Tiles are not intended for installation over existing roof systems. Existing roof coverings and underlayment are to be removed, and roof sheathing and penetrations are to be inspected to ensure the roof structure is free of rot and damage prior to installation of the Ergosun products. All past existing roof coverings shall be completely removed, following all installation conditions noted in Section 4.1 and 4.2.

4.4 Roof Fire Classified Assemblies:

Ergosun Integrated Solar Tiles comply for use as Class A roof-assemblies per 2021 / 2018 IBC Section 1505.1 and 2021 / 2018 IRC Section R902.1 as outlined in Table 4 of this report. Installation and assembly details, including maximum roof slope, are to be in accordance with Section 8.2 of this report.

5.0 LIMITATIONS:

- Installation of Ergosun Integrated Solar Tiles are to comply with the applicable codes, this report and the manufacturer's installation instructions. Where differences are found, the applicable code and this report govern.
- Ergosun Integrated Solar Tiles are intended for use on roof slopes ≥ 2-1/2:12 (21%).
- Maximum allowable wind uplift pressure must be determined in accordance with Table 3 of this report. Us in applications greater than those stated require approval by a registered design professional and approval by the authority having jurisdiction.
- Attachment of sheathing to underlying framing members and attachment of battens is outside the scope of this report and shall in compliance with the applicable code and be sufficient to resist uplift forces and service loads required.
- Special inspection for wind resistance may be required as per Section 4.1.1 of this report.
- Ergosun Integrated Solar Tiles used in Class A roof-assemblies are to be installed in accordance with Sections 4.4 and 8.2 Table 4 of this report.
- Evaluation by QAI is limited to use as an approved roof covering through evaluation for performance requirements to the noted applicable codes. Compliance with BIPV requirements are per listing and labeling by an agency approved as a Nationally Recognized Testing Laboratory (NRTL) by the Occupational Safety and Health Administration (OSHA) PTLSolar, LLC.
- Ergosun Integrated Solar Tile products are manufactured in Coralville, IA with inspections by QAI Laboratories.

6.0 SUPPORTING INFORMATION:

The following data has been evaluated for Ergosun Integrated Solar Tile products:

- Data for use in roof fire classified assemblies determined in accordance with ASTM E108.
- Data outlining minimum CC2 rate of burning for plastic components determined in accordance with ASTM D635.
- Data outlining spontaneous ignition temperature > 650^{o}F (343^{o}C) for plastic components determined in accordance with ASTM D1929.
- Data outlining smoke density <75% for plastic components determined in accordance ASTM D2843
- Data for wind uplift resistance evaluated in accordance with ASTM D3161 and TAS 107.
- Data for wind driven rain resistance evaluated in accordance with TAS 100.
- Solar PTL, LLC. Certificate of Compliance (TU 722440004 01) for compliance with ANSI/UL 61730-1 and ANSI/UL 61730-2.
- Lab Test Certification Inc. Certificate of Compliance (LC16101-2) for compliance with ANSI/UL 61730-1 and ANSI/UL 61730-2.
- Data for roof tile static uplift resistance in accordance with TAS 102.

7.0 MARKING:

Ergosun Integrated Solar Tile finished products are labeled with the product and model name, manufacturer's name (Ergosun Holdings, LLC), location of manufacture, and the QAI CER-1047. Examples of finished product labels can be seen in Figure 1 below.

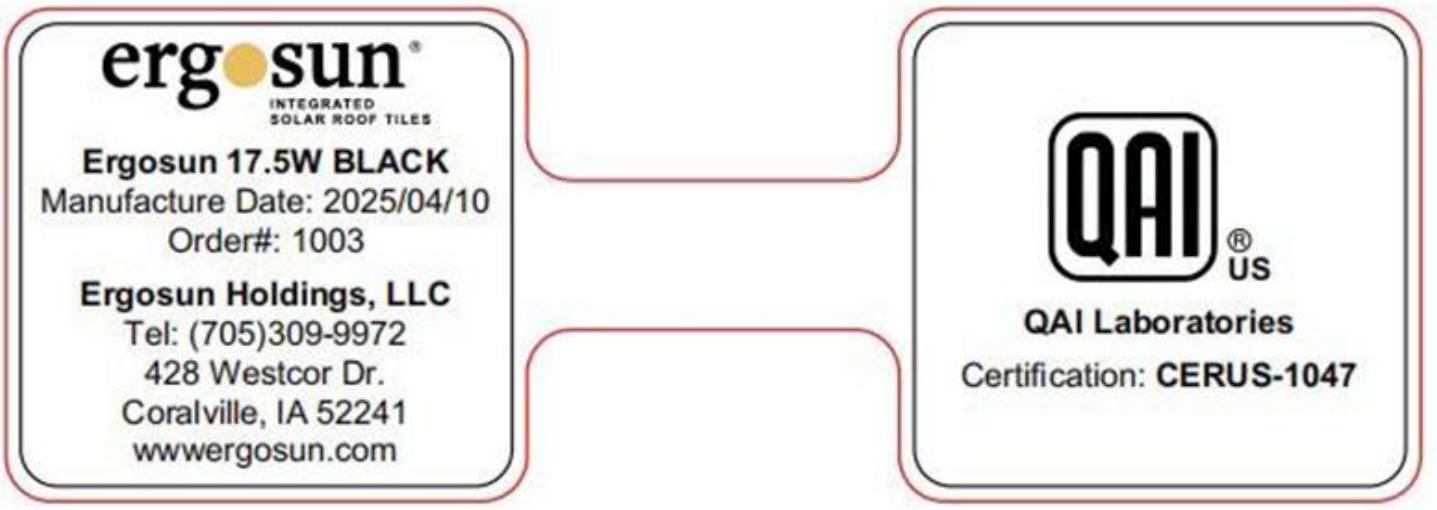

Figure 1 – Representative Example of Ergosun Integrated Solar Tile Product Label

8.0 RESULTS/RATINGS:

8.1 Wind Uplift Resistance

Table 2 – Wind Uplift Classification Assembly Details

Product	Substrate[1]	Battens[2]	Tile Installation
Ergosun Integrated Solar Tile	Minimum 15/32-inch (12 mm) plywood	2" x 2" (38 mm x 38 mm) wood battens running perpendicular to rafters spaced 12-inches (305 mm) on center. Battens fastened with a No. 8 x 3-inch (76 mm) long bugle head wood screw at the intersection of each batten and rafter.	Each tile is fastened at preset fastener locations (see Figure 2) to battens using two (2) Minimum No. 8 by 2-1/2-inch (64 mm) length corrosion resistant screws.

1. Attachment of sheathing to underlying framing members and attachment of battens is outside the scope of this report and shall be sufficient to resist uplift forces required.
2. Wood battens should have a minimum specific gravity (SG) of 0.42.

Table 3 – Wind Uplift Resistance Values[1,2]

Product	Aerodynamic Multiplier - λ	Attachment Resistance Moment – M_f	Slope	Restoring Moment due to Gravity - M_g	Allowable Wind Uplift Pressure – P_{asd}[3,4]
Concrete Base Tile	0.291 ft^3 (0.008m^3)	24.4 ft-lbf (33.2 Nm)	≤ 4:12	6.61 ft-lbf (9.0 Nm)	106 psf (5.1 kPa)
			5:12	6.48 ft-lbf (8.8 Nm)	106 psf (5.1 kPa)
			6:12	6.31 ft-lbf (8.6 Nm)	105 psf (5.0 kPa)
			≥ 7:12	6.13 ft-lbf (8.3 Nm)	105 psf (5.0 kPa)

1. Aerodynamic multiplier, attachment resistance moment, restoring moment due to gravity and allowable wind uplift pressure are determined based on assembly configuration and installation as described in Table 3.
2. Ergosun Integrated Solar Tiles have been evaluated in accordance with ASTM D3161 / TAS 107 as a steep-slope roof covering, installed as per Table 3, and achieved a Class F wind resistance rating, demonstrating that the integration of the PV unit and associated components onto the listed base tile do not detract from the wind uplift resistance values established for the base tile assembly.
3. Values have been calculated in accordance with RAS 127.
4. See Section 4.1.1 where Special Inspection, including periodic inspection of the above installation is required.

8.2 Roof Fire Classified Assemblies:

Table 4 – Roof Fire Classified Assemblies

System	Substrate	Approved Underlayment	Approved Roof Coverings	Installation Guidelines	Maximum Slope	Class
New construction or reroof when existing roof is removed[1]	Minimum 15/32-inch (12 mm) plywood	One layer Titanium UDL 30 synthetic roofing underlayment installed over sheathing. End laps shall be 4-inches (102 mm) and be offset by 6 feet. (1.8 m)	Ergosun 17.5W Black, Ergosun 15W Black, and Ergosun 15W Sedona Red	See Sections 4.1, 4.2, 4.3, 4.4	Unlimited	A

1. Installation of the Ergosun Integrated Solar Tiles requires complete removal of existing roof coverings and underlayment and inspection prior to installation in accordance with Section 4.3 of this report.

9.0 PRODUCT DETAILS:

9.1 Ergosun Integrated Solar Tile Product Drawing

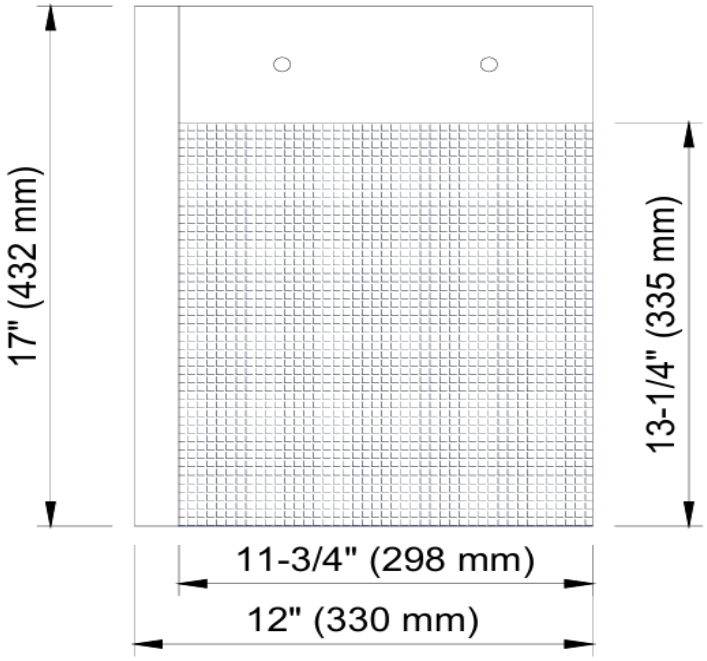

Figure 2 – Ergosun Integrated Solar Tile Product Dimensions

10.0 SUPPLEMENTAL CODES

10.1 2023 / 2020 Florida Building Code:

Ergosun Integrated Solar Tiles as detailed in Sections 2.0 through 9.0 of QAI CER_{US}-1047 comply with the 2023 / 2020 Florida Building Code (FBC) requirements for a roof covering including photovoltaic modules / shingles Section 1507.17 when installed in accordance with the applicable building codes and this report including for use in high velocity hurricane zones (HVHZ) for applications as outlined in this report.

Ergosun Integrated Solar Tiles comply for use as Class A roof-assemblies per Section 1516.2 of the 2023 / 2020 FBC when installed in an assembly outlined in Table 4 of Section 8.2 of this report.

Ergosun Integrated Solar Tiles have been evaluated for wind resistance performance in accordance with TAS 107 and achieved a Class F rating when installed as per Table 2 in Section 8.1 of this report. Maximum allowable wind uplift pressures in accordance with TAS 102 and RAS 127 are outlined in Table 3 of this report.

Ergosun Integrated Solar Tiles have been evaluated for resistance to wind driven rain in accordance with TAS 100 and achieved a passing result as per the requirement of Section 1523.6.4.1 of the 2023 / 2021 FBC.

For use in HVHZ Ergosun Integrated Solar Tiles must be installed in accordance with Section 1518.8.2 of the 2023 / 2021 FBC and in compliance with Roofing Application Standard RAS 118, RAS 119, RAS 120.

11.0 ELIGIBILITY OF REPORT

QAI's Code Evaluation Report complies with the 2021 / 2018 IBC Section 104.11 *Alternative materials, design and methods of construction and equipment* subsection 104.11.1 *Research Reports*. Supporting data has been evaluated by QAI for compliance of the noted materials and assemblies to the applicable code by QAI, and *approved* source as detailed below.

The attached report has been reviewed by a QAI Registered Professional Engineer approved by the specific state Board of Professional Engineers noted on the specific P.E. seal(s).

Per section 1703 of the IBC, QAI is an independent third-party testing, inspection and certification agency accredited by the International Accreditation Service, Inc. (IAS) for this specific scope (see IAS PCA-118). QAI can confirm that based on its IAS accreditation it meets IBC Section 1703.1 on Independence, Section 1703.1.2 on Equipment and Section 1703.1 on Personnel.

This Evaluation report has been designed to meet the performance requirements of IBC Section 1703.4 and contains the required information to show the product, material or assembly meets the applicable code requirements.

The product is labeled per section IBC 1703 and subject to follow-up inspection per IBC 1703.6 using QAI IAS accredited ISO/IEC 17020 inspection program (see IAS AA-723).

For more information regarding QAI Laboratories, please visit www.qai.org.

The above is an example of the QAI registered Listing mark. The Listing mark may only be used by the Report Holder per the QAI service agreement on products defined in this report. The 'us' indicator in the 4 o'clock position indicates the product complies with the properties evaluated with limitations outlined in this report for use in the US market. A 'c' indicator in the 8 o'clock position indicates the product has been evaluated for use in the Canadian market.

IAS ACCREDITED Product Certification Agency PCA-118

12.0 REFERENCED STANDARDS

ASTM E108 *Standard Test Methods for Fire Tests of Roof Coverings*.
ASTM D635 *Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*.
ASTM D1929 *Test Method for Determining Ignition Temperature of Plastics*.
ASTM D2843 *Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.*
ASTM D3161 *Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method).*
RAS 127 *Procedure for Determining the Moment of Resistance and Minimum Characteristic Resistance Load to Install a Tile System on a Building of a Specified Roof Slope and Height Using Allowable Stress Design (ASD) in Accordance with ASCE 7*
ASTM C1568 *Standard Test Method for Wind Resistance of Concrete and Clay Roof Tiles (Mechanical Uplift Resistance Method)*
TAS 107 *Test Procedure for Wind Resistance Testing of Non-rigid, Discontinuous Roof System Assemblies*
TAS 112 *Standard Requirements for Concrete Roof Tiles*
TAS 102 *Test Procedure for Static Uplift Resistance of Mechanically Attached, Rigid Roof Systems*
TAS 100 *Standard Test Method for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems*