UL Evaluation Report

UL ER485228-01

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UL Category Code: ULEZ

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Sub-level 2: 07 30 00 – Steep Slope Roofing
Sub-level 3: 07 31 00 – Shingles and Shakes

DIVISION: 26 00 00 – ELECTRICAL
Sub-level 2: 26 30 00 – Facility Electrical Power Generating and Storing Equipment
Sub-level 3: 26 31 00 – Photovoltaic Collectors

COMPANY:

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1. SUBJECT: **GAF Energy Roofing and Solar System aka DecoTech™ Roof-Integrated Solar System (consisting of GAF Roofing System combined with GAF Energy Solar System or GAF Solar Energy System or DecoTech RI 2000)**

2. SCOPE OF EVALUATION

- 2018 and 2015 *International Building Code* ® (IBC)
- 2018 and 2015 *International Residential Code* ® (IRC)
- 2018 and 2015 *International Fire Code* ® (IFC)
- 2020, 2017 and 2014 *NFPA 70 National Electric Code* ® (NEC)
- 2018 and 2015 *NFPA 1 Fire Code*
- ICC ES Acceptance Criteria for Quality Documentation (AC10), Dated January 2019

The products were evaluated for the following properties:

- External Fire Exposure (UL2703 and UL790)
- Wind Resistance (UL1897)
- Electrical Shock and Fire Hazards (UL1703)
- Electrical bonding (UL2703)
- Mechanical loading (UL2703 and UL1703)
- Environmental conditions (UL1703)
- Durability (UL1703)

3. REFERENCED DOCUMENTS

- UL790, Standard Test Methods for Fire Tests of Roof Coverings
- UL1897, Uplift Tests for Roof Covering Systems
- UL1703, Flat-Plate Photovoltaic Modules and Panels
- UL2703, Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
- ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- ICC ES Acceptance Criteria for Quality Documentation (AC10), Dated January 2019

4. USES

The GAF Energy Roofing and Solar System, is a combination of a photovoltaic (PV) mounting system (GAF DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System), photovoltaic modules, and a roofing system, resulting in a roof assembly which also provides electrical power. The photovoltaic modules convert power in the visible portion of the electromagnetic spectrum to DC electrical power. The GAF Energy Roofing and Solar System also provides weather protection and resistance to wind. The system is also intended for use where Class A, B or C fire classification of roof coverings are required by Section 1505 of the IBC and Section R902 of the IRC.

5. PRODUCT DESCRIPTION

The GAF Energy Roofing and Solar System is a PV system with integral module mounting that is integrated with the roofing system and designed for landscape module orientation only.

The GAF Energy Roofing and Solar System consists of the following components:

1. An underlayment of one layer of "StormGuard®", self-adhered
2. One layer of "VersaShield® SOLO™ Fire-Resistant Slip Sheet", mechanically fastened
3. PV mounting system either DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System
4. PV modules either Solaria PowerXT or Silfab SLA-M.

The dimensions of the module assembly is dependent upon the PV module used, either Solaria PowerXT or Silfab SLA-M.

Solaria PowerXT modules are approximately 65.3 inches (1,659 mm) long by 45.0 inches (1,143 mm) wide. The weight of the framed module, five mounting feet and MLPE bracket is 55 pounds (25 kg).

Silfab SLA-M modules are approximately 66.5 inches (1,689 mm) long by 40.0 inches (1,016 mm) wide.. the weight of the framed module, five mounting feet and MLPE bracket is 51 pounds (23 kg).

For both PV modules, the front of the module is 1.67 inches (42 mm) in depth.

- DecoTech RI 2000 utilizes Solaria PowerXT or Silfab SLA-M modules
- GAF Solar Energy System or GAF Energy Solar System utilizes Solaria PowerXT modules

The PV mounting system, DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System consists of a module assembly provided with five Adjustable Feet for roof attachment, MLPE bracket, MLPE (either a DC optimizer or an AC microinverter) and wire clips. These systems are built in the field with the provided hardware.

The solar modules are listed in accordance with UL1703 and the GAF Energy Roofing and Solar System is UL Listed in accordance with UL2703 and UL790 as required by Section 1505.9 of the IBC, Section 902.4 of the IRC and Section 690.4(B) of the NEC.

6. INSTALLATION

The GAF Energy Roofing and Solar System is intended to be installed in accordance with the applicable codes, this report, and the manufacturer's published installation instructions. The system is to be installed in accordance with Article 690 of the NEC, and either Section 1512 of the IBC or Sections R907 and R324 of the IRC, as applicable, except as noted in this report.

The manufacturer's published installation instructions must be available at all times on the jobsite during installation.

Prior to installation of the underlayment, the deck surface must be clean, dry and free of debris. Damaged sheathing must be replaced.

The modules are installed on roofs having a minimum slope of 4:12 (33% slope).

6.1 Sheathing:

The roof deck must be code-complying, minimum 7/16-inch thick (11 mm) non-veneer APA rated series, oriented strand boards (OSB) sheathing or minimum 15/32-inch thick (12 mm), exterior plywood complying with DOC PS-1 or DOC PS-2.

6.2 System Components:

System parts, supplied by GAF, are required components to properly install the GAF Energy Roofing and Solar System in accordance with manufacturer's installation instructions.

6.3 Underlayment:

One layer of self-adhered GAF StormGuard® Leak Barrier must be installed directly on the roof deck in accordance with manufacturer's installation instructions. One layer of VersaShield® SOLO Fire Resistant Slip Sheet must be installed over the layer of GAF StormGuard® Leak Barrier, and mechanically fastened in accordance with manufacturer's installation instructions.

GAF StormGuard® Leak Barrier complies with ASTM D1970 as specified in Section 1507.1.1 Exception 1 of the IBC and Section R905.1.1 Exception 1 of the IRC.

6.4 Flashing:

Flashing components, supplied by GAF, are designed to provide transition between the GAF DecoTech™ RI 2000, GAF Solar Energy System, or GAF Energy Solar System and the surrounding roof covering. Flashing components are of AZ55-coated galvalume steel.

6.5 Fasteners:

#14-10x1.25-inch screws are used to secure the PV mounting system to the roof deck.

10-32x3/8-inch hex head screws are used for the interconnection of the components of the PV mounting system (DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System).

6.6 Roof Covering:

The GAF Energy Roofing and Solar System must be installed in conjunction with a code-complying roof covering consisting of asphalt shingles.

The PV mounting system, DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System with the Solaria PowerXT or Silfab SLA-M solar modules must be installed over the required layers of underlayment as described in Section 6.3 and be attached with fasteners described in Section 6.5. Fasteners must only be placed at designated locations as indicated on GAF Energy Roofing and Solar System, system parts and manufacturer's installation instructions.

7. FIRE CLASSIFICATION:

7.1 The GAF Energy Roofing and Solar System installed in accordance with this report has been tested for system fire classification Class A in accordance with UL2703 and fire classification Class A in accordance with UL790 and is intended for use where Class A, B, or C roof coverings are required in accordance with Section 1505 of the IBC or Section R902.4 of the IRC. GAF Energy Roofing and Solar System may be installed where non-classified roofing is permitted in the code.

Refer to UL File E485228.QIMS for UL2703 and UL File R10689.TGFU for UL790 for applicable coverage and details.

8. WIND RESISTANCE:

8.1 The GAF Energy Roofing and Solar System covered under this report has been tested for wind uplift resistance in accordance with UL1897, and therefore qualify for use in accordance with Section 1504.3.1 of the IBC. The allowable wind uplift pressures for the roof assemblies are noted in Table 1.

The GAF Energy Roofing and Solar System shall be designed to resist the design wind load pressures for components and cladding in accordance with Chapter 16 of the IBC or Section R905 of the IRC.

9. MECHANICAL LOADING:

9.1 The GAF Energy Roofing and Solar System covered under this report has been tested for mechanical loading in accordance with UL2703:

Module type	Max positive design load achieved (psf)	Max negative design load achieved (psf)	Max sloped design load achieved (psf)
Solaria PowerXT models	50	40	5
Silfab Solar SLA-M model	50	50	5

10. ELECTRICAL:

10.1 The PV mounting system, DecoTech RI 2000 or GAF Energy Solar System or GAF Solar Energy System with the Solaria PowerXT or Silfab SLA-M solar modules covered under this Report have been tested in accordance with UL1703 and UL2703, and therefore qualify for use in accordance with Article 690 of the NEC. These modules are intended for operation interactively with a grid-connected electric utility supply. The routing of the conductors, the sizing of the conductors, the disconnecting means, the rapid shutdown system, and the overcurrent protection shall be in accordance with the NEC using the following electrical ratings:

PV Model No.	**Solaria Solaria PowerXT - 360R-PD**	**Silfab SLA-M 310 Wp**
V_{oc} - Open-circuit Voltage	47.7 V	40.25 V
V_{MP} - Operating Voltage	39.5 V	33.05 V
Max System Voltage	1000 V	1000 V
I_{sc} - Short-circuit Current	9.56 A	9.93 A
I_{MP}- Current at Rated Operating Voltage	9.13 A	9.38 A
Watts - Max Power	360 W	310 W
Max Series Fuse Current Rating	15 A	20 A

The DC/DC converters and microinverters shall be sized and installed in accordance with the Article 690 of the NEC, and the DC/DC converters and microinverters manufacturers' installation instructions. These components shall be attached to the DecoTech RI 2000 or GAF Energy Solar System or GAF Solar Energy System in accordance with the component manufacturer's installation instructions and the installation instructions for the DecoTech RI 2000 or GAF Energy Solar System or GAF Solar Energy System.

10.2 The GAF Energy Roofing and Solar System covered under this report has been tested for bonding in accordance with UL2703.

11. CONDITIONS OF USE

The GAF Energy Roofing and Solar System described in this Report comply with, or are suitable alternatives to, what is specified in those codes listed in Section 2 of this Report, subject to the following conditions:

11.1 Materials and methods of installation shall comply with this Report and the manufacturer's published installation instructions. In the event of a conflict between the installation instructions and this Report, this Report governs.

11.2 The solar modules must be installed in accordance with Article 690, Article 705, and applicable sections in Chapters 1 through 4 of the NEC as specified in Section 10 of this report. Solar energy performance of this product is outside the scope of this report.

11.3 The Silfab and Solaria solar modules must be installed in conjunction with the code-complying, approved roof coverings specified in Section 6.6 of this report. The approved roof covering must be installed in accordance with the applicable code and the roof covering manufacturer's instructions.

11.4 The routing of the conductors, the sizing of the conductors, the disconnecting means, the rapid shutdown system, and the overcurrent protection shall be in accordance with the NEC using the information in Section 10 of this report and the manufacturer's installation instructions.

11.5 The roof sheathing and roof framing system must be designed for the appropriate loads determined in accordance with the applicable code, subject to the approval of the code official.

11.6 Installation must comply with the applicable requirements in Section 605.11 of the IFC, Section R324.6 of the IRC, or Section 11.12.2 of NFPA-1.

11.7 Wind uplift pressures on any roof area, including edges and corner zones shall not exceed the allowable wind pressure for the roof covering installed in that particular area. Refer to Table 1.

11.8 The allowable wind uplift pressures listed in Table 1 are for the roof systems only. The deck and structural framing to which the roofing system is attached shall be designed for the applicable components and cladding, wind loads in accordance with the applicable code.

11.9 See UL Product iQ™ database for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels (QIMS), File E485228.

11.10 See UL Product iQ™ database for Roofing Systems (TGFU), File R10689.

11.11 The components are assembled in Genoa, IL and Wanju-gun, South Korea under the UL LLC Listing and Follow-Up Service Program, which includes audits in accordance with quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC10.

12. SUPPORTING EVIDENCE

12.1 Manufacturer's descriptive product literature, including installation instructions.

12.2 UL test reports and Listing in accordance with UL2703. See UL Product Certification Category for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels (QIMS), E485228.

12.3 UL test reports and Certification in accordance with UL790. See UL Product Certification Category for Roofing Systems (TGFU), File R10689.

12.4 Data in accordance with UL1897.

12.5 Test reports in accordance with UL1703.

12.6 Quality Documentation in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC10, dated January 2019.

13. IDENTIFICATION

The GAF Energy Roofing and Solar System described in this Evaluation Report is identified by a marking bearing the report holder's name (GAF), the plant identification, the product name, the UL Listing Mark and the evaluation report number ER485228-01. The validity of this Evaluation Report is contingent upon this identification appearing on the product.

14. USE OF UL EVALUATION REPORT

14.1 The approval of building products, materials or systems is under the responsibility of the applicable authorities having jurisdiction.

14.2 UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.

14.3 The current status of this report, as well as a complete directory of UL Evaluation Reports may be found at UL.com via our UL Product iQ™ database:

UL Evaluation Reports

Table – 1
Fire and Wind Resistance Assemblies

System No.	1
Deck	Min. 7/16-in. thick Oriented Strand Board
Underlayment	One layer of GAF StormGuard® Leak Barrier, self-adhered.
Slip Sheet	One layer of GAF VersaShield® SOLO™ Fire-Resistant Slip Sheet, mechanically fastened.
Array Start	Starter Bar (System Part) secured to the deck with three #14-10x1.25-inch screws per each mounting foot. The fasteners are installed in the pre-drilled holes. Adjustable feet to starter bar attached with one 10-32x3/8-inch hex head screw. Minimum of two mounting feet per starter bar section in accordance with the manufacturer's installation instructions.
Solar Array	GAF DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System secured to the deck with six #14-10x1.25-inch screws, per adjustable mounting foot assembly. Five adjustable mounting foot assemblies per each solar module. Adjustable feet to module frame attached with one 10-32x3/8-inch hex head screw. The clips/mounts spaced approximately 12-3/4-in. OC. The fasteners are installed in the pre-drilled holes in the adjustable mounting feet. Solaria PowerXT or Silfab SLA-M PV modules mounted in accordance with the manufacturer's installation instructions.
Tested Pressure (psf)	58
Allowable Wind Uplift Pressure (psf)[1]	29
Fire Rating in accordance UL790 (Roofing Systems (TGFU): Class A – Other Systems No. 9)	Class A at Unlimited incline

System No.	2
Deck	Min. 15/32 in. thick Plywood
Underlayment	One layer of GAF StormGuard® Leak Barrier, self-adhered.
Slip Sheet	One layer of GAF VersaShield® SOLO™ Fire-Resistant Slip Sheet, mechanically fastened.
Array Start	Starter Bar (System Part) secured to the deck with three #14-10x1.25-inch screws per each mounting foot. The fasteners are installed in the pre-drilled holes. Adjustable feet to starter bar attached with one 10-32x3/8-inch hex head screw. Minimum of two mounting feet per starter bar in accordance with the manufacturer's installation instructions.
Solar Array	GAF DecoTech RI 2000 or GAF Solar Energy System or GAF Energy Solar System secured to the deck with three #14-10x1.25-inch screws, per adjustable mounting foot assembly. Five adjustable mounting foot assemblies per each solar module. Adjustable feet to module frame attached with one 10-32x3/8-inch hex head screw. The clips/mounts spaced approximately 12-3/4-in. OC. The fasteners are installed in the premade holes in the adjustable mounting feet. Solaria PowerXT or Silfab SLA-M PV modules mounted in accordance with the manufacturer's installation instructions.
Tested Pressure (psf)	60
Allowable Wind Uplift Pressure (psf)[1]	30
Fire Rating in accordance UL790 (Roofing Systems (TGFU): Class A – Other Systems No. 9)	Class A at Unlimited incline

Notes:

[1]A safety factor of 2 was applied to the maximum load achieved without failure.