

ICC-ES Evaluation Report**ESR-2991***

Reissued July 2012

This report is subject to renewal October 1, 2014.

www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 07 00 00—Thermal and Moisture Protection
Section: 07 31 00—Shingles and Shakes**DIVISION: 26 00 00—Electrical**
Section: 26 31 00—Photovoltaic Collectors**REPORT HOLDER:****THE DOW CHEMICAL COMPANY**
DOW SOLAR
1381 BUILDING
MIDLAND, MICHIGAN 48667
(989) 633-1145
<http://www.dowsolar.com>**EVALUATION SUBJECT:****DOW POWERHOUSE™ SOLAR SHINGLES****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2012, 2009 and 2006 *International Residential Code*® (IRC)

Properties

- Fire classification
- Wind resistance
- Weather resistance

2.0 USES

DOW POWERHOUSE™ Solar Shingles, when installed in conjunction with one of the code-complying roof coverings described in Section 3.6 of this report, are a building-integrated photovoltaic (BIPV) roof covering that also generates electricity from the sun. The DOW POWERHOUSE™ Solar Shingles are recognized for use where Class A, B or C roof coverings are required by IBC Section 1505 and IRC Section R902.1.

3.0 DESCRIPTION**3.1 DOW POWERHOUSE™ Solar Shingles:**

The shingles are approximately 22.8 inches (579 mm) long by 23.4 inches (594 mm) wide by 0.49 inch (12.4 mm) thick. Each shingle overlaps the row beneath, resulting in an exposed area 22.8 inches (579 mm) long by 10 inches (254 mm) wide. The average weight is 5.3 pounds (2.4 kg) per shingle, resulting in an approximate installed weight of 3.3 pounds per square foot. The shingles are self-sealing by means of adhesive strips located on the underside of the leading edge. Each shingle includes two integral connection points (connector header housings) which

accept connecting parts (biscuits), as well as system parts including electrical connectors. The shingles are available in several models, designated as DPS-xx-1000, where "xx" indicates the power output rating of the unit.

3.2 System Parts:

System parts, supplied by Dow, are designed to provide transition between the DOW POWERHOUSE™ Solar Shingles and the surrounding roof covering. Functionality is also provided for electrical connectivity between rows and to start and end the system wiring.

3.3 Underlayment:

Underlayment for the field of the roof must comply with the requirements of the applicable code for installation of the approved roof covering noted in Section 3.6.

GAF Versashield® Fire-Resistant Roof Deck Protection and GAF Versashield™ Underlayment are recognized in [ESR-2053](#).

3.4 Flashing: Self-adhering underlayment or cap sheet must be at least 16 inches (406 mm) wide and must comply with ASTM D1970 or ASTM D6164, respectively, or be recognized in a current ICC-ES evaluation report as complying with the Acceptance Criteria for Roof Underlayment for Use in Severe Climate Areas (AC48). Use of self-adhering underlayment or cap sheet is limited to use in accordance with the Dow Solar installation instructions and Section 4.3 of this report.

3.5 Fasteners:

The required fasteners for DOW POWERHOUSE™ Solar Shingles and system parts must be minimum 1½-inch-long (38 mm), No. 11 gage, ring-shank roofing nails, having a shank diameter of 0.120 inch (3.05 mm) and a head diameter of 0.375 inch (9.52 mm). As an alternate to the nails, No. 8 wood screws having a 1¼-inch (32 mm) length may be used. The nails and screws must have a corrosion-resistant coating complying with ASTM A153.

3.6 Approved Roof Covering:

The DOW POWERHOUSE™ Solar Shingles must be installed in conjunction with a code-complying roof covering consisting of asphalt shingles, flat-profile concrete or clay tiles, slate shingles, wood shakes or wood shingles, plastic tiles or plastic panels. The plastic tiles or plastic panels must be recognized in a current ICC-ES evaluation report as complying with the Acceptance Criteria for Special Roofing Systems (AC07).

4.0 DESIGN AND INSTALLATION**4.1 General:**

DOW POWERHOUSE™ Solar Shingles must be installed in accordance with this report, the Dow Solar installation

***Revised April 2014**

instructions and the applicable code. The instructions must be available on the jobsite at all times. The roof covering must be installed in accordance with the roof covering manufacturer's instructions and the applicable code.

4.2 Roof Slope:

DOW POWERHOUSE™ Solar Shingles are installed on roofs having a minimum slope of 2:12 (17% slope) or the minimum slope required for the applicable roof covering. The roof deck must be solidly sheathed with either minimum $\frac{7}{16}$ -inch-thick (11.1 mm) nonveneer APA-rated series sheathing (oriented strand board), minimum $\frac{3}{4}$ -inch-thick (19 mm) wood-sheathing boards or minimum $\frac{15}{32}$ -inch-thick (11.9 mm) plywood complying with U.S. DOC PS-1 or PS-2.

4.3 Underlayment:

Underlayment, as described in Section 3.3, must be applied in accordance with the requirements of the applicable code for the approved roof covering. One layer of GAF VersaShield® Fire-Resistant Roof Deck Protection must be installed under the DOW POWERHOUSE™ Solar Shingles in accordance with Dow Solar installation instructions. For installation with asphalt shingles and roof slopes between 2:12 (17% slope) and 4:12 (33% slope), two layers of UL asphalt-saturated felt or one layer of self-adhered underlayment complying with UL 1970 are required under the GAF VersaShield® Fire-Resistant Roof Deck Protection. Self-adhering underlayment or cap sheet as described in Section 3.4, or minimum 12-inch-wide (305 mm), 26 gage [0.019-inch-thick (0.48 mm)] galvanized steel, serves as flashing under the first row, and over the last row, of DOW POWERHOUSE™ Solar Shingles in accordance with the Dow Solar installation instructions.

When installation is with an approved concrete or clay tile, metal flashing must be installed in accordance with Dow Solar installation instructions. When installation is with approved slate shingles, underlayment and flashing must be installed in accordance with the code and with Dow Solar installation instructions.

Underlayment used underneath approved plastic tiles or plastic panels must be in accordance with the ICC-ES evaluation report for the plastic tile or plastic panel. Self-adhering underlayment or cap sheet used as flashing must be installed as specified in the Dow Solar installation instructions.

Underlayment and interlayment for use with a wood shake or wood shingle approved roof covering must be installed in accordance with the applicable code.

4.4 Shingle Installation:

DOW POWERHOUSE™ Solar Shingles must only be installed on roofs in conjunction with a code-complying roof covering as described in Section 3.6 of this report. The solar shingles and system parts must be installed over required layers of underlayment as described in Section 4.3. The release layer on the solar shingle must be removed from the adhesive strip before the shingles and system parts are nailed down. The solar shingles must be attached with fasteners described in Section 3.5. Fasteners must only be placed at designated nailing locations as indicated on DOW POWERHOUSE™ Solar Shingles and system parts. All connections must be tightly fitted and spaced according to Dow Solar installation instructions.

4.5 Roof Classification:

DOW POWERHOUSE™ Solar Shingles installed in accordance with this report are recognized for use where

Class A, B or C roof coverings are required in accordance with IBC Section 1505 or IRC Section R902.1. The resulting roof classification will be the classification of the approved roof covering. The DOW POWERHOUSE Solar Shingles may be installed where nonclassified roofing is permitted in the code.

4.6 Wind Resistance:

DOW POWERHOUSE™ Solar Shingles installed in accordance with this report have been tested for wind resistance, in accordance with ASTM D3161, at a wind speed of 110 mph (49.2 m/s), and qualify for Classification Requirement F as noted in 2012 IBC Table 1507.2.7.1(2) and 2012 IRC Table R905.2.4.1(2). The provisions of the 2012 codes must be applied in jurisdictions using the 2009 and 2006 codes. The wind resistance for approved roof coverings must be as indicated in the applicable code or evaluation report.

5.0 CONDITIONS OF USE

The DOW POWERHOUSE™ Solar Shingles described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 DOW POWERHOUSE™ Solar Shingles must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. If there are any conflicts between the manufacturer's published installation instructions and this report, this report governs.
- 5.2 Recognition of the solar shingles is limited to their use as a roof covering; the electrical safety requirements and solar energy performance of this product are outside the scope of this report.
- 5.3 The solar shingles must be installed in conjunction with one of the code-complying, approved roof coverings specified in Section 3.6 of this report. The approved roof covering must be installed in accordance with the applicable code and the roof covering manufacturer's instructions. Installations with an approved plastic tile or plastic panel roof covering must be in accordance with this report and the ICC-ES evaluation report for the plastic tile or plastic panel.
- 5.4 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.
- 5.5 Under the 2012 codes, installation must comply with the applicable requirements in Section 605.11 of the *International Fire Code*®.
- 5.6 The DOW POWERHOUSE™ Solar Shingles are manufactured by the Dow Chemical Company, under a quality control program with inspections by ICC-ES..

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Building-integrated Photovoltaic (BIPV) Roof Covering Systems (AC365), dated September 2013.

7.0 IDENTIFICATION

DOW POWERHOUSE™ Solar Shingles bear a product label that includes the Dow Chemical Company name, the manufacturing location, the product name and model number, the lot number, and the ICC-ES evaluation report number (ESR-2991).

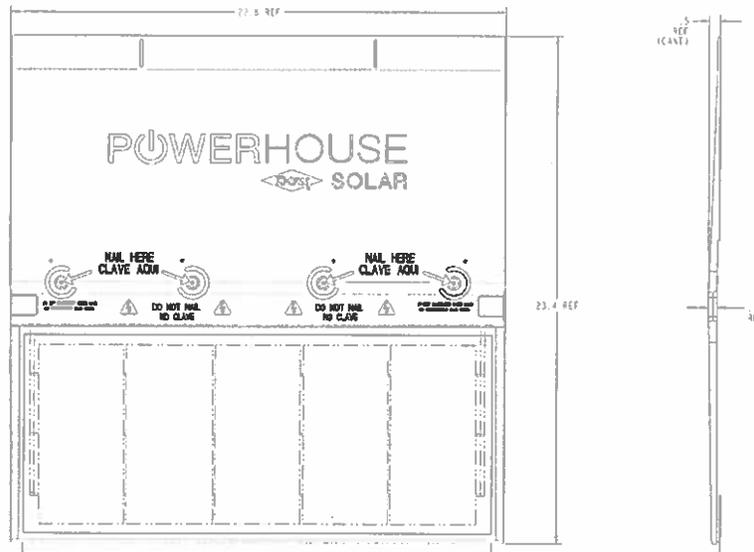


FIGURE 1—DOW POWERHOUSE™ SOLAR SHINGLE

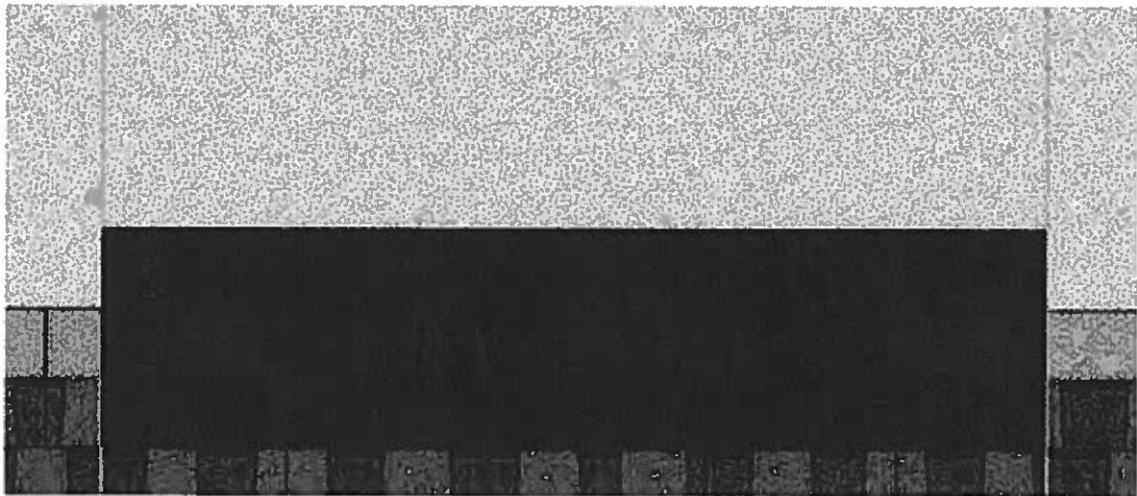


FIGURE 2—TYPICAL FLASHING DETAIL
(DETAIL SHOWING ASTM D1970, ASTM D6164, OR METAL FLASHING
OVER GAF VERSASHIELD® FIRE-RESISTANT ROOF DECK PROTECTION)

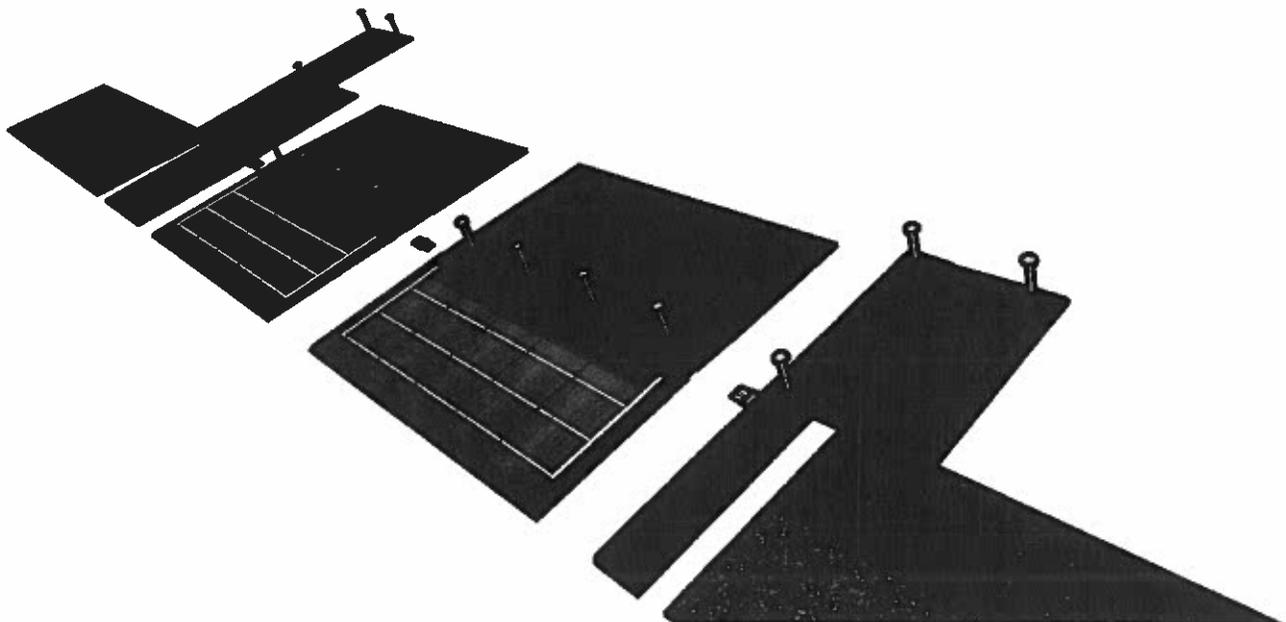


FIGURE 3—TYPICAL INSTALLATION DETAIL – INTEGRATION OF DOW POWERHOUSE™ SOLAR SHINGLES
WITH ASPHALT SHINGLE ROOFING