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**ANSI/SPRI IA-1**

**Standard Field Test Procedure for Determining  
the Uplift Resistance of Insulation and Insulation  
Adhesive Combinations over Various Substrates**

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Approved November 19, 2015

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**Disclaimer**  
This standard is for use by architects, engineers, roofing contractors and owners of low slope roofing systems. SPRI, its members and employees do not warrant that this standard is proper and applicable under all conditions.

## 1.0 Introduction

This standard specifies a field-testing procedure to determine the uplift resistance of a specific roof insulation/adhesive combination. This testing procedure encompasses various types of insulation adhesives, substrates and insulations.

## 2.0 Definitions

**2.1 Tare weight**—The sum of the weights of all items used to connect the test sample to the load cell. Common items include, but are not limited to, plywood, attachment plate, fasteners, chain or rod.

**2.2 Substrate**—The surface upon which the insulation is applied.

**2.3 Attachment Plate**—A component of the testing equipment designed to facilitate the attachment of the test sample to the load applying device.

## 3.0 Equipment (See Commentary 3)

**3.1** Use a portable pull testing instrument capable of measuring pounds force (lbf) (kN) to an accuracy of  $\pm 5$  lbf (0.0222 kN). The instrument shall display the instantaneous load value achieved during a test pull. If the instrument reads in units other than lbf, the reading shall be converted to lbf.

**3.2** The instrument shall have a dated calibration certificate showing the calibrated values for the full range of the load instrument. It shall be calibrated every 12 months or sooner if there is reason to suspect that it might be out of tolerance. Calibration shall be performed to a standard that is traceable to a nationally recognized source.

## 4.0 Testing Procedure

**4.1** The test sample shall include the following components of the proposed new roof assembly: (See Figure A for an example of a test cross-section. See Commentary 4.1)

**4.1.1** Substrate: Bare deck or existing roofing system (recover);

**4.1.2** Vapor or air retarder if part of the design;

**4.1.3** First insulation layer; and

**4.1.4** Attachment assembly.

**4.2** The sample size shall be 24 in x 24 in (610 mm x 610 mm) with the insulation adhesive applied according to the adhesive manufacturer's specifications. Application of ribbon applied adhesive shall be applied equidistantly from the centerline of the test specimen. (See Figure B) Any excess adhesive (overspray) that falls outside the 24 in x 24 in (610 mm x 610 mm) sample area shall be cut away from the test sample to ensure the results are not skewed. Any adhesive ribbons applied along the outside edge of the test sample shall be omitted from the test sample.

**4.3** The area chosen for the test shall be prepared in the same manner as proposed for the new roofing system's assembly.

**4.4** When the roofing project includes a tear-off of the existing roof system, the existing roofing materials shall be removed, exposing the substrate to be adhered to for the test.

**4.5** This test shall not be performed when the substrate temperature is below freezing. (See Commentary C4.5)

**4.6** A 24 in x 24 in (610 mm x 610 mm) piece of CDX grade plywood minimum 23/32 in (18.2 mm) thick material shall be adhered to the top of the insulation or cover-board with an appropriate bonding agent, following the insulation adhesives manufacturer's specifications. The weight shall be measured and recorded for inclusion in the tare weight calculation.

- 4.6.1** If alternate means or material is selected for attachment plate it shall be sufficient to exceed the expected maximum performance of the assembly. The attachment plate selected shall be noted in the test report.
- 4.7** Means shall be provided to attach the plywood, (or other as appropriate), to the pull-testing instrument sufficient to exceed the maximum limit of the pull tester load cell.
- 4.8** The assembly shall be allowed to cure at least the minimum time specified by the insulation adhesive manufacturer before the pull test is conducted.
- 4.9** When testing adhesive bond to an existing roof for a recover application, cut a 2 in (51 mm) to 3 in (76 mm) wide strip through the roof covering to the deck around the outside edge of the test panel. Do not stand on the panel while cutting it and avoid walking on it. Remove the cut strip material. (See Commentary 4.9)
- 4.10** The pull-testing instrument shall then be connected to the attachment plate.
- 4.11** The load shall be applied perpendicularly to the roof deck as follows:
- 4.11.1** The test shall begin when the load equals 120 lbf (0.5338 kN) plus the tare weight.
- 4.11.2** Increase the load in 60 lbf (0.2669 kN) increments. Hold each incremental load for 60 seconds. Continue until failure occurs.
- 4.11.3** Failure occurs when any component of the assembly loses connection to itself or subsequent components. See 4.14 for examples of failure modes. (See Commentary 4.11.3)
- 4.11.4** The maximum load value maintained for 60 seconds shall be recorded and converted to pounds per square foot (psf) (KPA) using a form similar to the one shown in Appendix A.
- 4.11.5** Perform a minimum of 4 pull tests for roof areas less than or equal to 50,000 square feet (4,650 square meters), and 2 additional pull tests for each additional 50,000 square feet (4,650 square meters) or portion thereof on each project. Test locations shall be selected in the corner and perimeter areas if conditions can not be replicated in the field of the roof. The tests shall not be performed in close proximity to one another so as to provide a representation of the entire roof area. Special caution and fall protection shall be implemented when testing in corner and perimeter areas. (See Commentary 4.11.5)
- 4.12** Each roof section with a different elevation, different substrate, or different surface condition shall be considered as an independent roof, and shall be tested independent of other roof sections in a manner consistent with 4.11.
- 4.13** The report shall include a roof plan identifying the location of each pull test. The roof plan shall be marked with the corresponding number of each test sample. The plan need not be to scale.

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- 4.14** Pull test results readings and modes of failure shall be recorded for each roof section. Some examples of failure modes are:
- 4.14.1** Adhesive from substrate: Loss of adhesive bond from substrate.
  - 4.14.2** Cohesive: Fracture of adhesive structure.
  - 4.14.3** Insulation Delamination: Facer separation from insulation core.
  - 4.14.4** Insulation Fracture: Structural break-up of insulation.
- 4.15** The actual instrument readings reflect the tare weight + the pounds (kN) of force resisted by the tested assembly. Actual pressure calculations shall be made by subtracting the tare weight from the instrument reading and dividing that number by the total area of the sample size tested (4 ft<sup>2</sup> [0.37 m<sup>2</sup>]). (See Commentary 4.11.5)
- 4.16 Precision and Bias**  
Based on tests performed at a SPRI member company laboratory, the test procedure has a sample-to-sample precision of  $\pm 10\%$  at the 95% confidence level\*. No information can be given on the bias of this test procedure for measuring the mechanical uplift resistance of insulation adhesives because no test material having an accepted reference value is available.
- \*Test results available through SPRI headquarters.

## **Commentary to Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates**

This Commentary is not a part of Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.

This Commentary consists of explanatory and supplementary material designed to assist users in complying with the requirements. It is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements or to provide other clarifications. The information contained in this Commentary is not part of this American National Standards (ANS) and has but been processed in accordance with ANSI's requirements for an ANS. As such, Commentary may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance with the standard.

The sections of the Commentary are numbered to correspond to the sections of the standard to which they refer. Since it is not necessary to have supplementary material for every section in the standard itself, there may be gaps in the numbering in the Commentary

### **C3.0 Equipment**

The load cell, test frame, and any other applicable test equipment should have load capacities that exceed the anticipated uplift loads or requirements.

### **C4.1 Test Area**

Perform the test in areas where damage is suspected or where water or other chemicals have infiltrated the roof system causing the roof deck or other components to deteriorate and cause lower pull values.

### **C4.5 Temperature of Test**

Consult the insulation adhesive manufacturer concerning the application temperature limitations of the adhesive. Certain deck types (gypsum, cementitious wood fiber, or lightweight insulating concrete) may be affected by free water. Pull values obtained over decks in a frozen state may be elevated and therefore unreliable.

### **C4.9 Care should be taken not to disturb the test specimen.**

### **C4.11.3 Determination of Failure**

Failure occurs at the substrate/first layer intersection or any other subsequent adhered intersections. It also occurs within the insulation itself, such as the facer lifting off or the core separating, or failure of the substrate. Separation of the test specimen from the plywood is not considered a failure of the adhesive. Record the value, as it may exceed the design value for the specific project.

### **C4.11.5 Use the lowest test value as the ultimate load resistance value unless it is shown to be an anomaly. Perform additional pull tests beyond the minimum number required under certain circumstances. These include, but are not limited to, occasions when:**

- ▶ pull values vary significantly;
- ▶ tests are performed on substrates that are inherently less consistent such as existing roof covers, lightweight insulating concrete, cementitious wood fiber, and gypsum;
- ▶ there exist multiple damaged or questionable areas;
- ▶ local building codes require additional tests;
- ▶ failure occurs at connection of test apparatus to plywood, but below required uplift values.

If there are anomalies in pull values, the substrate should be inspected by a qualified professional to determine the cause.

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C4.15 The actual instrument readings reflect the tare weight + the pounds (kN) of force resisted by the tested assembly. Actual pressure calculations are made by subtracting the tare weight from the instrument reading and dividing that number by the total area of the sample size tested.

For example: On a 24 in x 24 in (610 mm x 610 mm) (4 sq ft) sample, if the tare weight is 10 lbs (0.0445 kN) and the instrument reading is 1010 lbs (4.4927 kN), the calculated uplift resistance of the assembly is  $(1010 \text{ lbs} - 10 \text{ lbs}) / 4 \text{ ft}^2 = 250 \text{ psf}$  ( $4.4927 \text{ kN} - 0.0445 \text{ kN}) / 0.3716 \text{ sq m} = 11.97 \text{ KPA}$ )

#### **Personnel**

A person who has been trained in the pull test procedure should perform the tests. A representative of the building owner should be present to witness the tests and verify the values. A roofing professional should also be present to repair the test areas and return the roof area to a watertight condition.

#### **Cautions**

See Commentary C4.5

#### **Deck Loading**

This test does not indicate the suitability of the existing roof (if being recovered), the deck or the deck's ability to withstand the uplift loads calculated by this procedure. A structural engineer or roofing design professional should obtain this information.

Figure A Cross Section of Assembly

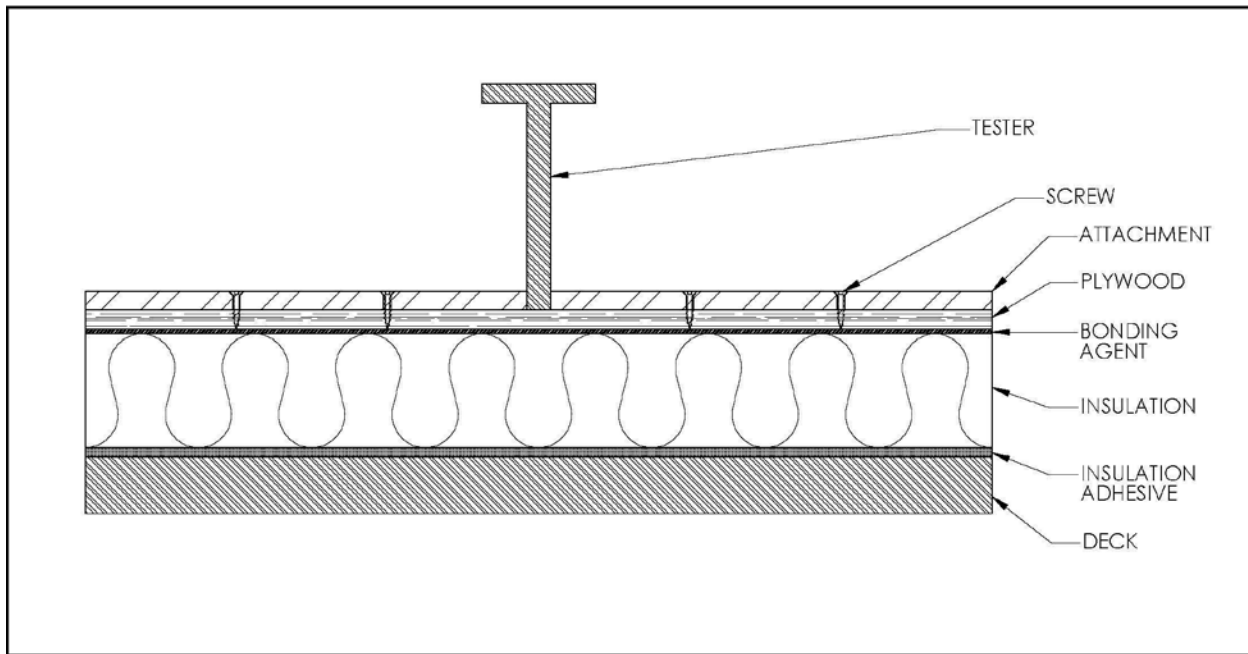
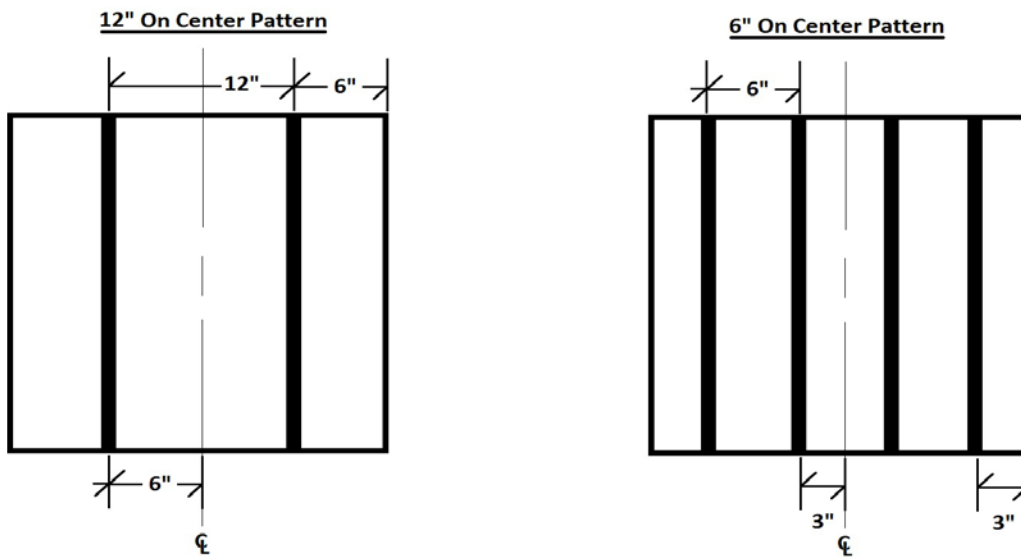


Figure B Bead Placement Examples



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## **Appendix A**

### **Insulation Test Report**

The following three pages contain Forms A, B and C. These forms or similar ones shall be used to report Mechanical Uplift Resistance of Insulation Adhesives test results.

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# Insulation Adhesive Test Report

## Form A

|  |  |  |
|--|--|--|
| Job Name   |  |  |
| Test Date  |  | Location   |
| Ambient Temp   |  | Roof Area sq ft (sq m)   |
| Tester Mfgr/Model  |  | Max. Cap. Of Tester      Check One: <input type="checkbox"/> lbf <input type="checkbox"/> kN                                   |
| Date of Last Calibration   |  | Number of Tests Recorded on Form C   |
| Insulation Manufacturer  | Insulation Type  | Insulation Thickness   |
| Adhesive Manufacturer  |  | Adhesive Type  |
| Test Performed by  |  | Witnessed by   |
| Test Cut Areas Repaired by   |  | Project Type:<br><input type="checkbox"/> New Construction <input type="checkbox"/> Tear-Off <input type="checkbox"/> Retrofit |
| <b>Deck type</b>   |  |  |
| <input type="checkbox"/> Steel<br>Gauge: _____   | <input type="checkbox"/> Gypsum<br>Thickness: _____  |  |
| <input type="checkbox"/> Structural Concrete<br>Thickness: _____<br>Check One: <input type="checkbox"/> Poured in place <input type="checkbox"/> Precast | <input type="checkbox"/> Wood<br>Thickness: _____<br>Check One: <input type="checkbox"/> OSB <input type="checkbox"/> Plywood <input type="checkbox"/> Plank |  |
| <input type="checkbox"/> Lightweight Concrete<br>Thickness: _____  | <input type="checkbox"/> Fiberglass<br>Thickness: _____  |  |
| <input type="checkbox"/> Insulating Concrete<br>Thickness: _____   | <input type="checkbox"/> Other: _____<br>Thickness: _____  |  |
| <input type="checkbox"/> Cementitious Wood Fiber<br>Thickness: _____   |  |  |
| <b>Optional Information</b>  |  |  |
| Test Time: _____   | Roof Cover Type (Check One):   |  |
| Building Height: _____   | <input type="checkbox"/> Mechanically Attached Single-ply  |  |
| Thickness of Existing Roof Assembly: _____   | <input type="checkbox"/> Modified Bitumen  |  |
| New Roofing System Manufacturer: _____   | <input type="checkbox"/> Ballasted Single-ply  |  |
|  | <input type="checkbox"/> Built-up Roofing  |  |
|  | <input type="checkbox"/> Fully Adhered Single-ply  |  |
|  | <input type="checkbox"/> Other: _____  |  |

Disclaimer: Manufacturer's installation requirements shall be followed when using any of the tested adhesives. Neither the technician performing the pullout test nor his/her company is responsible for the waterproofing integrity of the repairs. This test report does not certify the structural integrity of the roof deck.



# Insulation Adhesive Test Report

## Form C

(Refer To the “Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates” for full documentation)

|           |
|-----------|
| Job Name  |
| Test Date |

① Tare Weight \_\_\_\_\_

| A               | B  | C  | D   | E   | F                   |
|-----------------|--|--|---|---|---------------------|
| <b>Test no.</b> | <b>Location on roof</b><br>(Roof plan on form B) | <b>Measurement pounds</b><br><b>force (lbf) (kN) ②</b> | <b>Less Tare</b><br><b>③ = ② - ① lbf (kN)</b> | <b>Resistance</b><br><b>④ = ③ ÷ 4.0 (.3716 sq m)</b><br><b>pounds/sq ft psf</b><br><b>Sample size 24 in x 24 in</b><br><b>(.6096 m x .6096 m)</b> | <b>Failure mode</b> |
| 1               |  |  |   |   |                     |
| 2               |  |  |   |   |                     |
| 3               |  |  |   |   |                     |
| 4               |  |  |   |   |                     |
| 5               |  |  |   |   |                     |
| 6               |  |  |   |   |                     |
| 7               |  |  |   |   |                     |
| 8               |  |  |   |   |                     |
| 9               |  |  |   |   |                     |
| 10              |  |  |   |   |                     |
| 11              |  |  |   |   |                     |
| 12              |  |  |   |   |                     |
| 13              |  |  |   |   |                     |
| 14              |  |  |   |   |                     |
| 15              |  |  |   |   |                     |
| 16              |  |  |   |   |                     |
| 17              |  |  |   |   |                     |
| 18              |  |  |   |   |                     |
| 19              |  |  |   |   |                     |
| 20              |  |  |   |   |                     |

Comments: