

## Code Evaluation Research Report

### Report Holder:

The Dow Chemical Company  
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### Evaluation Subject:

STYROFOAM™ RS 2045 Spray Polyurethane Foam

### 1.0 Evaluation Scope:

#### Code Evaluation Criteria:

- 2007 Florida Building Code–Building (FBC-B)
- 2007 Florida Building Code–Residential (FBC-R)
- Florida Product Approval Rule 9B-72

#### Properties Evaluated:

- Thermal Resistance
- Surface-Burning Characteristics
- Water Vapor Barrier
- Air Permeability
- Physical Properties

#### Quality Assurance Evaluation:

- Quality Assurance Program Elements

#### Florida State and Miami-Dade Product Approval Criteria:

- Determination of applicability within scope definitions

### 2.0 Evaluated Uses:

STYROFOAM™ RS 2045 Spray Polyurethane Foam is used as thermal insulating materials. The insulation is for use in walls, wall cavities, floor assemblies or ceiling assemblies, or attics and crawl spaces.

### 3.0 Description:

STYROFOAM™ RS 2045 Spray Polyurethane Foam is a two-component, closed-cell, spray-applied, semi-rigid, medium-density, polyurethane foam plastic insulation. STYROFOAM™ RS 2045 Spray Polyurethane Foam is produced in the field by combining a polymeric isocyanate component A with a resin-based component B.

### 4.0 Properties:

#### 4.1 Thermal Resistance:

The thermal resistance (R-values) at an average temperature of 75°F (23.9°C) for the STYROFOAM™ RS 2045 Spray Polyurethane Foam is as follows:

Thermal Resistance (R-values)  
Based on ASTM C518 Test Standard

Thickness (in.)	R-Values (°F·ft <sup>2</sup> ·h/Btu)
1	6.3
1.5	9.4
2	13
2.5	16
3	19
3.5	22
4	25
5	31
6	38
7	44
8	50
9	57
10	63
11	69
12	76

Based on 180 days aged @ 73° F +/- 2 & 50% RH

For SI: 1 in. = 25.4 mm,

1°F·ft<sup>2</sup>·hr/BTU = 0.156 K·m<sup>2</sup>/W

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**4.2 Surface Burning Characteristics:**

Insulation, at a maximum thickness of 4" (102 mm) was tested to the ASTM E84 Standard to comply with the FBC-R, Section R314.3. The results also demonstrate compliance with FBC-B, Section 2603.5.4.

Test Results:

Flame Spread Index: Less than 25  
Smoke-Developed Index: Less than 450

STYROFOAM™ RS 2045 Spray Polyurethane Foam meets the following fire classification requirements of FBC-B, Section 803.1

Fire Classification: Class A

Interior wall or ceiling, constructed with minimum 1/2 inch Type X Gypsum wallboard and up to 12 inches of STYROFOAM™ RS 2045 Spray Polyurethane Foam in the wall or roof cavities, comply with NFPA 286. This assembly meets the acceptance criteria for interior wall or ceiling finishes as described in FBC-R Section R314.4 or FBC-B Section 803.2.

STYROFOAM™ RS 2045 Spray Polyurethane Foam was tested in accordance with NFPA 259.

Results:

Average Potential Heat: 11,658 Btu/lb  
(27,117 KJ/kg)

**4.3 Vapor Retarder:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam has a vapor permeance of 1 perm or less at a minimum thickness of 2.2 inch in accordance with ASTM E96. This product qualifies as a vapor retarder per FBC-B, Section 1203.2.

**4.4 Air Permeability:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam Insulation, at a minimum thickness of 1/2 inch (12.7 mm), has an air permeance of less than 0.02 L/s-m<sup>2</sup> in accordance ASTM E 2178 and is considered air-impermeable in accordance with FBC-R, Section R806.4.

**4.5 Physical Properties:**

Typical Properties	Standard	Value
Nominal Core Density (lb/ft <sup>3</sup> )	ASTM D1622	2.0

**5.0 Installation:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam shall be installed in accordance with the manufacturer's published installation instructions and this report. A copy of the manufacturer's published installation instructions must be available at all times on the jobsite during installation.

The insulation is spray-applied on the jobsite using a volumetric displacement pump to combine the Part A and B components at a one-to-one ratio, as specified in the manufacturer's published installation instructions. The insulation is use only in areas where the maximum service temperature is equal to or less than 225°F (107°C). The substrates to which the insulation is applied must be free of moisture (dew or frost), grease, oil solvents and other materials that would adversely affect the adhesion of the spray polyurethane foam. The spray foam insulation must not be applied in electrical outlet or junction boxes or in direct contact with water or soil.

STYROFOAM™ RS 2045 Spray Polyurethane Foam shall be separated from the interior of the building by an approved thermal barrier of 1/2-inch thick (12.7 mm) Type X gypsum wallboard or equivalent 15 minute thermal barrier complying with, and installed in accordance with, FBC-B, Section 2603.4 or FBC-R, Section R314.4, applicable, except when installation is specifically approved in attics or crawl spaces as described in FBC-R Section R314.5.3, Section R314.5.4, Section R314.6; FBC-B Section 2603.9.

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**Code Evaluation Research Report****6.0 Quality Assurance Standard:**

Southwest Research Institute (SwRI) has been chosen to perform qualification and verification testing as well as third-party quality assurance services for the Dow Chemical Company, to include STYROFOAM™ RS 2045 Spray Polyurethane Foam. SwRI is a third-party quality assurance Entity accredited, by the International Services (IAS) based on ISO 17020 (certificate no. AA-665). SwRI is also an accredited, independent testing laboratory based on ISO 17025 (certificate no. TL 214).

**7.0 Florida State Product Approval:****7.1 Florida Product Approval Scope:**

The Florida Product Approval system is limited to products and systems which comprise the building envelope and structural frame for compliance to the structural requirements of the Florida Building Code per rule 9B-72.005.

**7.2 Florida Product Approval Findings:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam, as evaluated for interior, non-structural uses listed in Section 2.0 of this report falls outside of the scope of Rule 9B-72.005 and does not meet the criteria for the Optional Florida Product Approval for structural properties.

**8.0 Miami-Dade Notice Of Acceptance (NOA):****8.1 Miami-Dade Notice Of Acceptance (NOA) Scope:**

Building Products used in Dade or Broward counties (The Geographically Designated High-Velocity Hurricane Zone) that protect the envelope of the building from being breached must be approved by the Building Code Compliance Office, Product Control Division.

**8.2 Miami-Dade Notice Of Acceptance (NOA) Findings:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam as evaluated for interior, non-structural uses listed in Section 2.0 of this report fall outside of the scope of Miami-Dade's Product Control Division's criteria and does not meet the criteria for a Miami-Dade Notice of Acceptance for envelope protection.

**9.0 Conditions of Use:**

STYROFOAM™ RS 2045 Spray Polyurethane Foam Insulation described in this report complies with, or is suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to conditions of this report as applied to applications which meet the requirements for a specific project:

**9.1 STYROFOAM™ RS 2045 Spray Polyurethane Foam** shall be installed in accordance with manufacturer's installations instructions and permitting documents submitted to local building code officials.

**9.2 STYROFOAM™ RS 2045 Spray Polyurethane Foam** has not been evaluated to be used structurally to resist axial, transverse or racking loads in this report.

**9.3 STYROFOAM™ RS 2045 Spray Polyurethane Foam** is only evaluated for use in walls, wall cavities, floor assemblies or ceiling assemblies, or attics and crawl spaces.

**10.0 Use of Report for Code Compliance:**

**10.1 FBC-B Section 104.11.1** allows Research Reports to provide supporting data for demonstrating code compliance of materials or assemblies.

**10.2** Evaluation of the subject of this Code Evaluation Research Report was performed through testing and engineering analysis to demonstrate compliance with the intent of the referenced code sections and standards listed in this report. Building Officials, having jurisdiction, are granted the duty and power through state statute to confer approvals for all material and assemblies through the permit process for specific projects based on the design use of products and methods per FBC-B Section 104.

**10.3** CBUCK Engineering and James L Buckner, P.E, SECB are an independent third party from the Report Holder and do not have or intend to have a financial interest in the Report Holder.

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**Code Evaluation Research Report**

**10.4** Code Evaluation Research Reports shall not be used to infer an endorsement by CBUCK Engineering of the manufacturer or product.

**10.5** Current Code Evaluation Research Reports are posted and viewable on CBUCK Engineering's website at [www.cbuckinc.net](http://www.cbuckinc.net).

**11.0 Identification**

**11.1** Identification shall comply with FBC-B, Section 2603.2 or FBC-R, Section R314.2 as applicable.

**11.2** The Part A component is packaged in 55-gallon (208 L) drums bearing labels with the report holder's name (The Dow Chemical Company) and address; the best use date and the lot number and the product trade name (Dow 3019 Isocyanate).

**11.3** The Part B components for STYROFOAM™ RS 2045 Spray Polyurethane Foam is packaged in 55-gallon (208 L) drums bearing labels with the report holder's name (The Dow Chemical Company) and address; the best use date and the lot number; the product trade name (polyol); processing parameters; the flame spread and smoke-development indices; the name of the inspection agency (Research Institute).

**12.0 Evidence Submitted:****12.1 Thermal Resistance**

ASTM C518 – “Test method for Steady-State Thermal Transmission properties By Means of the Heat Flow Meter Apparatus”

By: R & D Services, Inc.  
Report #: RD09130 (1), Dated: 10/9/09  
RD09130 (2), Dated: 10/9/09  
RD09130 (3), Dated: 10/9/09  
RD09130 (4), Dated: 10/9/09  
RD09130 (5), Dated: 10/9/09

**12.2 Fire Performance Characteristics**

ASTM E84 – “Standard Test Method for Surface Burning Characteristics of Building Materials”

By: Southwest Research Institute.  
Report #: 01.14203.01.001d, Dated: 10/7/08  
01.14203.01.001e, Dated: 10/7/08  
01.14203.01.001f, Dated: 10/7/08

NFPA 286 – “Standards Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth”

By: Southwest Research Institute.  
Report #: 01.14436.01.221[1], Dated: 10/13/09

NFPA 259 – “Standard Test Method for Potential Heat of Building Materials”

By: Southwest Research Institute.  
Report#: 01.13544.01.618b, Dated: 6/18/08

**12.3 Vapor Barrier**

ASTM E96 – “Test Method for Water Vapor Transmission of Materials”

By: R & D Services, Inc.  
Report #: RD09254, Dated: 4/9/09

**12.4 Air Permeability**

ASTM E2178 – “Standard Test Method for Air Permeance of Materials”

By: Architectural Testing, Inc.  
Report #: 86820.03-106-31, Dated: 4/9/09

**12.5 Physical Properties**

ASTM D1622 – “Standard Test Method for Apparent Density of Rigid Cellular Plastics”

By: R & D Services, Inc.  
Report #: RD09435, Dated: 8/10/09

ASTM D1621 – “Standard Test Method for Compressive Properties of Rigid Cellular Plastics”

By: R & D Services, Inc.  
Report #: RD09249(2), Dated: 10/7/09

ASTM D1623 – “Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics”

By: R & D Services, Inc.  
Report #: RD09249(3), Dated: 10/7/09

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ASTM D2856 – “Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer”

By: R & D Services, Inc.

Report #: RD09249(5), Dated: 10/7/09

**12.6 Quality Assurance**

Southwest Research Institute (SwRI), Certificate no. AA-665.

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The scope of this certification is limited by the report criteria and conditions.

James L. Buckner, P.E, S.E.C.B.

Board Certified Structural Engineer

SECB # 1058-0705

Florida Registered Evaluation Engineer.

FBC ANE #1916