



## Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

Report No: 2310-01



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### SWD Urethane Quik-Shield® DRAGON Spray Polyurethane Foam for Use in Unvented Attics and Crawlspaces

Trade Secret Report Holder:

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#### CSI Designations:

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 19 - Foamed-in-Place Insulation

Section: 07 27 36 - Sprayed Foam Air Barrier

## 1 Innovative Product Evaluated<sup>1</sup>

1.1 SWD Urethane Quik-Shield DRAGON Spray Polyurethane Foam (SPF)

## 2 Product Description and Materials

2.1 The label for the innovative product evaluated in this report is shown in **Figure 1**.



**Figure 1.** SWD Urethane Quik-Shield DRAGON Label

Report Number: 2310-01 SWD Urethane Quik-Shield® DRAGON Spray Polyurethane Foam for Use in Unvented Attics and Crawlspaces

Information contained in this report was developed using report holder's confidential intellectual property (IP) and trade secrets (TS), which is protected by Defend Trade Secrets Act 2016, © DrJ Engineering, LLC

Subject to Renewal: 04/01/27  
Page 1 of 14



- 2.2 Quik-Shield DRAGON is an open-cell SPF insulation product.
- 2.3 *Density*: Nominal 0.5 pounds per cubic foot (pcf) (8 kg/m<sup>3</sup>)
- 2.4 Quik-Shield DRAGON is produced in the field by combining an isocyanate (Component A) with a proprietary resin (Component B).
- 2.5 As needed, review material properties for design in **Section 6** and the regulatory evaluation in **Section 8**.

### 3 Definitions<sup>2</sup>

- 3.1 New Materials<sup>3</sup> are defined as building materials, equipment, appliances, systems, or methods of construction, not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.<sup>4</sup> The design strength and permissible stresses shall be established by tests<sup>5</sup> and/or engineering analysis.<sup>6</sup>
- 3.2 Duly authenticated reports<sup>7</sup> and research reports<sup>8</sup> are test reports and related engineering evaluations that are written by an approved agency<sup>9</sup> and/or an approved source.<sup>10</sup>
  - 3.2.1 These reports utilize intellectual property and/or trade secrets to create public domain material properties for commercial end-use.
    - 3.2.1.1 This report protects confidential Intellectual Property and trade secrets under the regulation, 18.U.S.Code.90, also known as Defend Trade Secrets Act of 2016 (DTSA).<sup>11</sup>
- 3.3 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is accredited and listed in the ANAB directory.
- 3.4 An approved source is “approved” when a professional engineer (i.e., Registered Design Professional, hereinafter RDP) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.<sup>12</sup>
- 3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.
  - 3.5.1 The Center for Building Innovation (CBI) is ANAB<sup>13</sup> ISO/IEC 17025 and ISO/IEC 17020 accredited.
  - 3.6 The regulatory authority shall enforce<sup>14</sup> the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing<sup>15</sup> stating the nonconformance and the path to its cure.
  - 3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.<sup>16</sup>
  - 3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory. Therefore, recognition of certificates and validation statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope shall be approved.<sup>17</sup> Thus, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent,<sup>18</sup> and can be used in any country that is an MLA signatory found at this link: <https://iaf.nu/en/recognised-abs/>
  - 3.9 Approval equity is a fundamental commercial and legal principle.<sup>19</sup>



## 4 Applicable Local, State, and Federal Approvals; Standards; Regulations<sup>20</sup>

### 4.1 Local, State, and Federal

- 4.1.1 Approved in all local jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured local jurisdictions: Austin, Baltimore, Broward County, Chicago, Clark County, Dade County, Dallas, Detroit, Denver, DuPage County, Fort Worth, Houston, Kansas City, King County, Knoxville, Las Vegas, Los Angeles City, Los Angeles County, Miami, Nashville, New York City, Omaha, Philadelphia, Phoenix, Portland, San Antonio, San Diego, San Jose, San Francisco, Seattle, Sioux Falls, South Holland, St. Louis County, Texas Department of Insurance, and Wichita.<sup>21</sup>
- 4.1.2 Approved in all state jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured states: California, Florida, New Jersey, Oregon, New York, Texas, Washington, and Wisconsin.<sup>22</sup>
- 4.1.3 Approved by the Code of Federal Regulations Manufactured Home Construction: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14<sup>23</sup> and Part 3280<sup>24</sup> pursuant to the use of ISO/IEC 17065 duly authenticated reports.
- 4.1.4 Approved means complying with the requirements of local, state, or federal legislation.

### 4.2 Regulations

- 4.2.1 *IBC – 18, 21, 24: International Building Code®*
- 4.2.2 *IRC – 18, 21, 24: International Residential Code®*
- 4.2.3 *IECC – 18, 21, 24: International Energy Conservation Code®*

### 4.3 Standards

- 4.3.1 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 4.3.2 *ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics*
- 4.3.3 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*
- 4.3.4 *ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*
- 4.3.5 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 4.3.6 *ASTM E2178: Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials*
- 4.3.7 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*

## 5 Listed<sup>25</sup>

- 5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (e.g., CBI), an approved agency (e.g., CBI and DrJ), and/or an approved source (e.g., DrJ), or other organization(s) concerned with product evaluation (e.g., DrJ), that maintains periodic inspection (e.g., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.



## 6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 Quik-Shield DRAGON is used in the following applications:

- 6.1.1 Non-structural thermal insulation in buildings of Type V construction in conformance to [IBC Section 2603.5](#) or in buildings in accordance with [IRC Section R303](#).<sup>26</sup>
- 6.1.2 As a sealant for penetrations as part of an air barrier system.

### 6.2 Thermal Resistance

- 6.2.1 Quik-Shield DRAGON may be used as thermal insulation in wall, roof, and ceiling assemblies.
- 6.2.2 These products meet the continuous insulating sheathing requirements complying with the provisions of [IRC Section N1102](#), [IECC Section C402](#), and [IECC Section R402](#).
- 6.2.3 Quik-Shield DRAGON has the thermal resistance as defined in **Table 1**.

**Table 1.** Thermal Resistance Properties

Product Name	Thickness (in)	Thermal Resistance (R-Values) <sup>1,2</sup> (°F•ft <sup>2</sup> •hr)/Btu
Quik-Shield DRAGON	1.0	3.9
	3.5	13.0

SI: 1 in = 25.4 mm, 1 (°F•ft<sup>2</sup>•hr)/Btu = 0.176 (K•m<sup>2</sup>)/W

1. Tested in accordance with ASTM C518 at a mean temperature of 75° F.  
2. R-Values are based on 90-day aged test results.

### 6.3 Surface Burning Characteristics

- 6.3.1 Quik-Shield DRAGON has the surface burning characteristics as shown in **Table 2**, when evaluated in accordance with ASTM E84 per [IBC Section 2603.3](#) and [IRC Section R303.3](#).<sup>27</sup>

**Table 2.** Surface Burning Characteristics<sup>1</sup>

Product Name	Flame Spread	Smoke Developed	Classification
Quik-Shield DRAGON	< 25	< 450	Class A

1. Tested in accordance with ASTM E84/UL723 at a thickness of 4".

### 6.4 Air Permeability

- 6.4.1 Quik-Shield DRAGON meets the requirements of [IRC Section N1101.10.5](#), [IECC Section R303.1.5](#), and [IECC Section C402.6.2.3.1](#),<sup>28</sup> for use as an air barrier material when installed in accordance with the manufacturer installation instructions and this report.
- 6.4.2 Air permeability characteristics are shown in **Table 3**, and are considered air impermeable insulation in accordance with [IRC Section R202](#) and [IRC Section R806.5](#).
- 6.4.3 Quik-Shield DRAGON is an air-barrier material and may be used as prescribed in [IRC Section R806.5](#), [IRC Section N1102.5](#),<sup>29</sup> [IECC Section C402.6](#),<sup>30</sup> and [IECC Section R402.5](#).<sup>31</sup>



**Table 3. Air Permeance**

Product Name	Air Permeability <sup>3</sup> [L/(s·m <sup>2</sup> )]
Quik-Shield DRAGON	< 0.02

1. Sprayed to a minimum thickness of 3½".  
2. Tested in accordance with ASTM E2178.  
3. Liter per second per square meter when tested at a pressure differential of 75 Pa.

## 6.5 Unvented Attic and Unvented Enclosed Rafter Assemblies

### 6.5.1 General:

6.5.1.1 Quik-Shield DRAGON is approved for use in unvented attic and unvented enclosed rafter assemblies in accordance with IBC Section 1202.3 provided the following conditions be met:

- 6.5.1.1.1 For penetrating items not needing full coverage, the perimeter (annular space) of the items must be covered in the approved SPF at the minimum thickness allowed.
- 6.5.1.1.2 For all attic volumes, steel or copper pipes penetrating the roof deck or gable do not need to be covered in SPF since these will not melt in typical unvented attic fire scenarios.
- 6.5.1.1.3 Vinyl or other thin plastic flexible ducts/vents may not penetrate the roof deck or gable unless it is covered with SPF at a minimum thickness of 3½" (89 mm).
- 6.5.1.1.4 Other items penetrating the roof deck or gable not specifically named in this report (other than steel or copper) need to be covered with SPF at a minimum thickness of 3½" (89 mm).
- 6.5.1.2 Quik-Shield DRAGON shall be separated from the building interior by a thermal barrier consisting of a minimum 1½" gypsum wallboard or equivalent in accordance with IBC Section 2603.4 or IRC Section R303.4,<sup>32</sup> except in unvented attics and crawlspaces as described in **Section 6.5.2** and **Section 6.5.3**.

### 6.5.2 Application in an Unvented Attic Without a Prescriptive Thermal Barrier or Ignition Barrier:

6.5.2.1 When Quik-Shield DRAGON is applied in unvented attics conforming to IRC Section R806.5, the following apply:

- 6.5.2.1.1 SPF shall be applied to the underside of roof sheathing at a minimum thickness of 3½" (89 mm).
- 6.5.2.1.2 Roof rafter or truss top chord member edges may be left exposed.
- 6.5.2.1.3 SPF shall be applied to vertical wall surfaces at a minimum thickness of 3½" (89 mm).
- 6.5.2.1.4 Wall stud edges may be left exposed.
- 6.5.2.1.5 Maximum thickness of the SPF is 18" (457 mm) on the underside of roof sheathing or on the vertical wall surfaces.
- 6.5.2.1.6 SPF insulation may be left exposed to the attic without a thermal barrier, prescriptive ignition barrier, or an intumescence coating.
- 6.5.2.1.7 Attic shall have access complying with IRC Section R807, horizontally placed in the floor and shall feature one of the following:
  - 6.5.2.1.7.1 A downward-opening hatch
  - 6.5.2.1.7.2 A pull down stair
  - 6.5.2.1.7.3 Access opening in accordance with IRC Section R807 using Rockfon® Pacific™ 201 Square Edge Ceiling Tile to cover the opening.



6.5.2.1.7.4 An attic access opening of 22 $\frac{1}{2}$ " x 30", or the baseline standard IRC size, was used to evaluate performance. The Rockfon Pacific 201 Square Edge Ceiling Tile is set on 1" x 2" trim installed around the opening. The typical installation is installing trim around the opening, where one-half of the trim width extends into the opening to support the panel. This allows fastening of the trim to the rough framing, where it is expected that there will be a 1" lip around the opening for Rockfon Pacific 201 Square Edge Ceiling Tile bearing.

6.5.2.1.7.5 The Rockfon Pacific 201 Square Edge Ceiling Tile shall have a maximum density of 8-pcf, a maximum binder content of three percent (3%) and shall be listed as a Class A product in accordance with ASTM E1264.

6.5.2.1.8 Vertical access openings are not permitted unless a project specific fire analysis is conducted that justifies its use.

6.5.2.2 *ABS/PVC Vent Pipes:*

6.5.2.2.1 For attics up to 46,080 $^3$  (1,305 m $^3$ ), any schedule 40 (minimum) ABS or PVC vent pipe does not need to be covered in SPF.

6.5.2.2.2 For attics larger than 46,080 $^3$  (1,305 m $^3$ ), schedule 40 (minimum) ABS or PVC vent pipe penetrations shall be covered with SPF at a minimum thickness of 3 $\frac{1}{2}$ " (89 mm), or may be left uncovered but limited in number and size so that the total area of holes created in the roof deck and gable do not exceed 36" $^2$  (23,226 mm $^2$ ).

6.5.2.2.3 ABS or PVC vent pipes thinner than schedule 40 (for any attic volume) must be covered with SPF at a minimum thickness of 3 $\frac{1}{2}$ " (89 mm), or may be left uncovered but limited in number and size such that the total area of holes created in the roof deck and gable do not exceed 36" $^2$  (23,226 mm $^2$ ).

6.5.2.3 *Flexible Metallic Ducts/Vents/Pipes Penetrating the Roof Deck or Gable:*

6.5.2.3.1 For attics up to 46,080 $^3$  (1,305 m $^3$ ), flexible metallic ducts/vents (aluminum or materials with higher melting/softening points than aluminum) or metallic vent pipes (aluminum or materials with higher melting/softening points than aluminum) penetrating the roof deck or gables do not need to be protected by SPF at a minimum thickness of 3 $\frac{1}{2}$ " (89 mm).

6.5.2.3.2 For attics greater than 46,080 $^3$  (1,305 m $^3$ ), flexible metallic ducts/vents (aluminum or materials with lower melting/softening points than aluminum) or metallic vent pipes (aluminum or materials with lower melting/softening points than aluminum), the roof deck or gables must be protected with SPF at a minimum thickness of 3 $\frac{1}{2}$ " (89 mm) or may be left uncovered but limited in number and size so that the total area of holes created in the roof deck and gable do not exceed 36" $^2$  (23,226 mm $^2$ ).

6.5.2.4 *Vinyl or Other Plastic HVAC Ducts/Vents Only Penetrating the Attic Floor (Supply and Return):*

6.5.2.4.1 For all attic volumes, vinyl or other plastic HVAC ducts/vents that only penetrate the attic floor do not need to be protected with SPF if the HVAC unit is alarmed to switch off with smoke or heat alarm switches within the attic space. Otherwise, the plastic HVAC duct must be protected by SPF at a minimum thickness of 3 $\frac{1}{2}$ " (89 mm).



6.5.2.5 *Flexible Metallic HVAC Ducts/Vents Only Penetrating the Attic Floor (Supply and Return):*

- 6.5.2.5.1 For attics up to 46,080<sup>13</sup> (1,305 m<sup>3</sup>), flexible metallic ducts/vents (aluminum or materials with higher melting/softening points than aluminum) that only penetrate the attic floor do not need to be protected with SPF. The HVAC unit does not need to be alarmed to switch off with smoke or heat alarm switches within the attic space for this application.
- 6.5.2.5.2 For attics greater than 46,080<sup>13</sup> (1,305 m<sup>3</sup>), flexible metallic HVAC ducts or vents (aluminum or materials with higher melting/softening points than aluminum) that only penetrate the attic floor do not need to be protected with SPF if the HVAC unit is alarmed to switch off with smoke or heat alarm switches within the attic space. Otherwise, the flexible metallic HVAC duct must be protected by SPF at a minimum thickness of 3<sup>1/2</sup>" (89 mm).

6.5.3 *Application in an Unvented Crawlspace Without a Prescriptive Thermal Barrier or Ignition Barrier:*

- 6.5.3.1 When Quik-Shield DRAGON is applied in unvented crawlspaces conforming to IRC Section R408.3:
- 6.5.3.1.1 SPF shall be applied to the underside of upper surface at a minimum thickness of 3<sup>1/2</sup>" (89 mm).
- 6.5.3.1.2 SPF shall be applied to vertical wall surfaces at a minimum thickness of 3<sup>1/2</sup>" (89 mm).
- 6.5.3.1.3 Wall stud edges may be left exposed.
- 6.5.3.1.4 Maximum thickness of the SPF is 18" (457 mm) on the underside of the upper surface or on the vertical wall surfaces.
- 6.5.3.1.5 SPF insulation may be left exposed to the crawlspace without a thermal barrier, prescriptive ignition barrier, or an intumescent coating.
- 6.5.3.1.6 Crawlspace access shall be provided in accordance with IRC Section R408.4.
- 6.5.3.1.7 Enclosures for items penetrating the upper surface or walls, such as plumbing and venting systems, shall be covered with Quik-Shield DRAGON insulation at a minimum thickness of 3<sup>1/2</sup>" (89 mm).

6.6 *Application for Use as an Interior Finish Without the Use of a Thermal Barrier or Ignition Barrier When Used with the Addition of IFTI DC315 Intumescence Coating*

- 6.6.1 Quik-Shield DRAGON SPF with a covering of DC315, applied in accordance with **Table 4**, was tested to NFPA 286 and met the acceptance criteria of IBC Section 803.1.1.1.
- 6.6.2 When DC315 is applied to Quik-Shield DRAGON SPF in accordance with **Table 4**, the assembly shall be permitted to be installed without a thermal barrier or ignition barrier in accordance with IBC Section 2603.9.

**Table 4.** Application of DC315 to Quik-Shield DRAGON SPF

Product Name	IFTI Product Name	Maximum Thickness of Quik-Shield DRAGON on Walls and Vertical Surfaces, in (mm)	Maximum Thickness on Ceilings, Underside of Roof Sheathing/Rafters, and Floor, in (mm)	Application of IFTI Coating
Quik-Shield DRAGON	DC315	8 (203)	14 (356)	18 mils wet (12 mils dry)
SI: 1 in = 25.4 mm				

- 6.7 Alternative techniques shall be permitted in accordance with accepted engineering practice and experience. These provisions for the use of alternative materials, designs, and methods of construction are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed herein. This includes, but is not limited to, the following areas of engineering: mechanics of materials, structures, building science, and fire science.



## 7 Certified Performance<sup>33</sup>

- 7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.<sup>34</sup>
- 7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.<sup>35</sup>

## 8 Regulatory Evaluation and Accepted Engineering Practice

- 8.1 Quik-Shield DRAGON complies with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:
  - 8.1.1 Physical properties of the product listed below:
    - 8.1.1.1 Tensile strength in accordance with ASTM D1623
    - 8.1.1.2 Density in accordance with ASTM D1622
    - 8.1.1.3 Dimensional stability in accordance with ASTM D2126
  - 8.1.2 Thermal performance (R-values) complying with the provisions of IRC Section N1102, IECC Section C402, and IECC Section R402.
  - 8.1.3 Surface burning characteristics complying with the provisions of IBC Section 2603.3 and IRC Section R303.3.<sup>36</sup>
  - 8.1.4 Air permeability in accordance with IRC Section R202, IRC Section R806.5, IRC Section N1102.5,<sup>37</sup> IECC Section C402.6.2.3.1,<sup>38</sup> and IECC Section R402.5.<sup>39</sup>
  - 8.1.5 Use in unvented attic spaces and crawlspaces without an ignition barrier in accordance with IBC Section 2603.4.1.6, IBC Section 2603.9, IRC Section R303.5.3,<sup>40</sup> and IRC Section R303.6.<sup>41</sup>
  - 8.1.6 Use without a thermal barrier in accordance with IBC Section 2603.4, IBC Section 2603.9, IBC Section 803.1.1.1, IRC Section R303.4,<sup>42</sup> and IRC Section R303.6,<sup>43</sup> when International Fireproof Technology, Inc. (IFTI) DC315 intumescence coating is applied.
- 8.2 Use in fire-resistance rated construction is outside the scope of this report.
- 8.3 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ, which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP or approved sources. DrJ is qualified<sup>44</sup> to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,<sup>45</sup> respectively.
- 8.4 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which is also its areas of professional engineering competence.

## 9 Installation

- 9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.
- 9.2 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.
- 9.3 SPF insulation shall be applied by licensed dealers and installers certified by SWD Urethane.
- 9.4 Quik-Shield DRAGON shall be applied to the framing using two-component spray equipment and shall be applied using a 1:1 ratio of Component A and Component B.



- 9.5 The substrate shall be dry and free of frost, ice, rust, oil, grease, dirt, or any other substances that may prevent adhesion of the SPF to the substrate.
- 9.6 Quik-Shield DRAGON is intended for interior use only and is not to be used where it could come in contact with water.
  - 9.6.1 Protection must be provided from weather during and after installation.
- 9.7 Where used as an air barrier in unventilated attics, the insulation shall be installed to the minimum thickness required and shall be installed in accordance with the provisions of IRC Section R806.
- 9.8 Quik-Shield DRAGON may be installed to the required thickness with one pass of the spray equipment. If installation using multiple passes is desired, no cure time is required between passes.
- 9.9 Do not use Quik-Shield DRAGON inside of electrical or junction boxes.
- 9.10 Quik-Shield DRAGON shall be installed only when the temperature is at or above 14° F (-10° C).
- 9.11 Insulation shall not be installed in areas where the service temperature is greater than 180° F (82° C).
- 9.12 For general SPF installation guidelines, see Guidance on Best Practices for the Installation of Spray Polyurethane Foam from the American Chemistry Council.

## 10 Substantiating Data

- 10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
  - 10.1.1 Tensile strength testing in accordance with ASTM D1623
  - 10.1.2 Density testing in accordance with ASTM D1622
  - 10.1.3 Dimensional stability testing in accordance with ASTM D2126
  - 10.1.4 Thermal resistance testing in accordance with ASTM C518
  - 10.1.5 Surface burning characteristics testing in accordance with ASTM E84
  - 10.1.6 Air permeability testing in accordance with ASTM E2178
  - 10.1.7 Fire testing of Quik-Shield DRAGON with IFTI DC315 Intumescent Coating in accordance with NFPA 286
- 10.2 Engineering analysis of cone calorimeter testing of Quik-Shield DRAGON foam for use in unvented attics and equivalency to QS 106 by Priest & Associates Consulting, LLC.
- 10.3 Engineering analysis justifying omitting the requirement to cover entire length of items penetrating roof deck with 3½" (89 mm) of SWD QS 106 or QS 108 by Priest & Associates Consulting, LLC.
- 10.4 Engineering analysis of Rockfon Pacific 201 ceiling panels by Priest & Associates Consulting, LLC.
- 10.5 Engineering analysis of use of SWD QS 106 SPF in unvented attics without an ignition barrier.
- 10.6 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or an RDP. Accuracy of external test data and resulting analysis is relied upon.
- 10.7 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.



- 10.8 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.
- 10.9 *Testing and Engineering Analysis*
- 10.9.1 The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.<sup>46</sup>
- 10.10 Where additional condition of use and/or regulatory compliance information is required, please search for Quik-Shield DRAGON on the DrJ Certification website.

## 11 Findings

- 11.1 As outlined in **Section 6**, Quik-Shield DRAGON has performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.
- 11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, Quik-Shield DRAGON shall be approved for the following applications:
- 11.2.1 Thermal performance (R-values) complying with the provisions of IRC Section N1102, IECC Section C402, and IECC Section R402.
- 11.2.2 Surface burning characteristics complying with the provisions of IBC Section 2603.3 and IRC Section R303.3.<sup>47</sup>
- 11.2.3 Air permeability in accordance with IRC Section R806.5, IRC Section N1102.5,<sup>48</sup> IECC Section C402.6.2.3.1,<sup>49</sup> and IECC Section R402.5.<sup>50</sup>
- 11.2.4 Use in unvented attic spaces and crawlspaces without an ignition barrier in accordance with IBC Section 2603.4.1.6, IBC Section 2603.9, IRC Section R303.5.3,<sup>51</sup> and IRC Section R303.6.<sup>52</sup>
- 11.2.5 Use without a thermal barrier in accordance with IBC Section 2603.4, IBC Section 2603.9, IBC Section 803.1.1.1, IRC Section R303.4,<sup>53</sup> and IRC Section R303.6,<sup>54</sup> when IFTI DC315 intumescent coating is applied.
- 11.3 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from SWD Urethane.
- 11.4 IBC Section 104.2.3<sup>55</sup> (IRC Section R104.2.2<sup>56</sup> and IFC Section 104.2.3<sup>57</sup> are similar) in pertinent part state:

**104.2.3 Alternative Materials, Design and Methods of Construction and Equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative is not specifically prohibited by this code and has been approved.

- 11.5 **Approved:**<sup>58</sup> Building regulations require that the building official shall accept duly authenticated reports.<sup>59</sup>
- 11.5.1 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited.
- 11.5.2 An approved source is “approved” when an RDP is properly licensed to transact engineering commerce.
- 11.5.3 Federal law, Title 18 US Code Section 242, requires that, where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.



- 11.6 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.
- 11.7 Through the IAF Multilateral Arrangement (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.<sup>60</sup>

## 12 Conditions of Use

- 12.1 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 12.2 As listed herein, Quik-Shield DRAGON SPS complies with, or is a suitable alternative to, what is specified in the codes listed in **Section 4**, subject to the following conditions:
  - 12.2.1 The manufacturer installation instructions and this report shall be available on the jobsite for inspection.
  - 12.2.2 The SPF insulation shall be installed in accordance with the manufacturer published installation instructions, this report, and the applicable code. If there is a conflict between the installation instructions and this report, the more restrictive governs.
  - 12.2.3 The SPF insulation shall be separated from the interior of the building by an approved 15-minute thermal barrier, except as noted in this report.
  - 12.2.4 When installed in unvented attics without a code-prescribed ignition barrier or thermal barrier, the installation shall meet the conditions outlined in **Section 6.5.3**.
  - 12.2.5 The use of vertical access openings into the unvented attic space is prohibited, unless a project specific engineering analysis is conducted to permit their use.
  - 12.2.6 The SPF insulation shall meet the minimum thicknesses and densities noted in this report.
  - 12.2.7 The SPF insulation shall be protected from the weather during and after application.
  - 12.2.8 The SPF insulation shall be applied by SWD Urethane approved dealers and installers.
  - 12.2.9 Use of the SPF insulation in areas where the probability of termite infestation is “*very heavy*” shall be in accordance with IBC Section 2603.8 and IRC Section R305.4,<sup>61</sup> as applicable.
  - 12.2.10 Jobsite certification and labeling of the SPF insulation shall comply with IRC Section N1101.10.1, IRC Section N1101.10.1.1, IECC Section C303.1.1, and IECC Section C303.1.1.1.
  - 12.2.11 A vapor retarder shall be installed in accordance with the applicable code.
  - 12.2.12 The components used to produce Quik-Shield DRAGON are manufactured in Mesa, Arizona, under a quality control program with inspections in accordance with IBC Section 2603.2 and IRC Section R303.2.<sup>62</sup>
- 12.3 When required by adopted legislation and enforced by the building official, also known as the Authority Having Jurisdiction (AHJ) in which the project is to be constructed:
  - 12.3.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.
  - 12.3.2 This report and the installation instructions shall be submitted at the time of permit application.
  - 12.3.3 This innovative product has an internal quality control program and a third-party quality assurance program.
  - 12.3.4 At a minimum, this innovative product shall be installed per **Section 9**.
  - 12.3.5 The review of this report by the AHJ shall comply with IBC Section 104.2.3.2 and IBC Section 105.3.1.



- 12.3.6 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.7.2, IBC Section 110.4, IBC Section 1703, IRC Section R104.7.2, and IRC Section R109.2.
- 12.3.7 The application of this innovative product in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.
- 12.4 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *“the building official shall make, or cause to be made, the necessary tests and investigations; or the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.2.3”*, all of IBC Section 104, and IBC Section 105.3.
- 12.5 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 12.6 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

## 13 Identification

- 13.1 Quik-Shield DRAGON, as listed in **Section 1.1**, is identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.
- 13.2 Additional technical information can be found at [swdurethane.com](http://swdurethane.com).

## 14 Review Schedule

- 14.1 This report is subject to periodic review and revision. For the latest version, visit [www.drjcertification.org](http://www.drjcertification.org).
- 14.2 For information on the status of this report, please contact [DrJ Certification](#).



## Notes

- 1 For more information, visit [drjcertification.org](http://drjcertification.org) or call us at 608-310-6748.
- 2 Capitalized terms and responsibilities are defined pursuant to the applicable building code, applicable reference standards, the latest edition of [TPI 1](#), the [NDS](#), [AISI S202](#), [US professional engineering law](#), [Canadian building code](#), [Canada professional engineering law](#), [Qualtim External Appendix A: Definitions/Commentary](#), [Qualtim External Appendix B: Project/Deliverables](#), [Qualtim External Appendix C: Intellectual Property and Trade Secrets](#), definitions created within Design Drawings and/or definitions within Reference Sheets. Beyond this, terms not defined shall have ordinarily accepted meanings as the context implies. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.
- 3 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1702>
- 4 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review <https://www.justice.gov/atr/mission> and <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3>
- 5 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.2.~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests>
- 6 The [design strengths](#) and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.1.~:text=Conformance%20to%20Standards-The%20design%20strengths%20and%20permissible%20stresses,-of%20any%20structural>
- 7 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1.~:text=the%20building%20official%20shall%20make%20C%20or%20cause%20to%20be%20made%2C%20the%20necessary%20tests%20and%20investigations%3B%20or%20the%20building%20official%20shall%20accept%20a%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.2.3>
- 8 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4.2>
- 9 [https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved\\_agency](https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_agency)
- 10 [https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved\\_source](https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_source)
- 11 <https://www.law.cornell.edu/uscode/text/18/1832> (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of \$5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The [federal government](#) and each state have a [public records act](#). To follow DTSA and comply state public records and trade secret legislation requires approval through [ANAB ISO/IEC 17065 accredited certification bodies](#) or [approved sources](#). For more information, please review this website: [Intellectual Property and Trade Secrets](#).
- 12 <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>
- 13 <https://www.cbitest.com/accreditation/>
- 14 <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.1.~:text=directed%20to%20enforce%20the%20provisions%20of%20this%20code>
- 15 <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3> AND <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#105.3.1>
- 16 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1>
- 17 <https://iaf.nu/en/about-iaf-mla#:~:text=Once%20an%20accreditation%20body%20is%20a%20signatory%20of%20the%20IAF%20MLA%2C%20it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope>
- 18 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- 19 <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>
- 20 Unless otherwise noted, the links referenced herein use un-amended versions of the [2024 International Code Council \(ICC\)](#) 2024 International Code Council (ICC) model codes as foundation references. Mississippi versions of the [IBC 2024](#) and the [IRC 2024](#) are un-amended. This material, product, design, service and/or method of construction also complies with the 2000-2012 versions of the referenced codes and the standards referenced therein. As pertinent to this technical and code compliance evaluation, CBI and/or DrJ staff have reviewed any state or local regulatory amendments to assure this report is in compliance.
- 21 See [Adoptions by Publisher](#) for the latest adoption of a non-amended or amended model code by the local jurisdiction. <https://up.codes/codes/general>
- 22 See [Adoptions by Publisher](#) for the latest adoption of a non-amended or amended model code by state. <https://up.codes/codes/general>
- 23 <https://www.ecfr.gov/current/title-24 subtitle-B chapter-XX part-3282 subpart-A section-3282.14>
- 24 <https://www.ecfr.gov/current/title-24 subtitle-B chapter-XX part-3280>
- 25 <https://www.ecfr.gov/current/title-24 subtitle-B chapter-XX part-3280#p-3280.2> (Listed%20or%20certified); <https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#listed> AND <https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#labeled>
- 26 [2021 IRC Section R316](#)
- 27 [2021 IRC Section R316.3](#)
- 28 [2021 IECC Section C402.5.1.3](#) AND [2018 IECC Section C402.5.1.2.1](#)
- 29 [IRC Section N1102.4](#)
- 30 [IECC Section C402.5](#)
- 31 [2021 IECC Section R402.4](#)
- 32 [2021 IRC Section R316.4](#)
- 33 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4>



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- 34 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text>All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%20livable%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades>
- 35 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur>
- 36 [2021 IRC Section R316.3](#)
- 37 [2021 IRC Section N1102.4](#)
- 38 [2021 IECC Section C402.5.1.3 AND 2018 IECC Section C402.5.1.2.1](#)
- 39 [2021 IECC Section R402.4](#)
- 40 [2021 IRC Section R316.5.3](#)
- 41 [2021 IRC Section R316.6](#)
- 42 [2021 IRC Section R316.4](#)
- 43 [2021 IRC Section R316.6](#)
- 44 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.
- 45 <https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?prgID=1&orgID=2125&statusID=4#:~:text=Bill%20Payment%20Date-,Accredited%20Scopes,-13%20ENVIRONMENT.%20HEALTH>
- 46 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition: <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>
- 47 [2021 IRC Section R316.3](#)
- 48 [2021 IRC Section N1102.4](#)
- 49 [2021 IECC Section C402.5.1.3 AND 2018 IECC Section C402.5.1.2.1](#)
- 50 [2021 IECC Section R402.4](#)
- 51 [2021 IRC Section R316.5.3](#)
- 52 [2021 IRC Section R316.6](#)
- 53 [2021 IRC Section R316.4](#)
- 54 [2021 IRC Section R316.6](#)
- 55 [2021 IBC Section 104.11](#)
- 56 [2021 IRC Section R104.11](#)
- 57 2018: <https://up.codes/viewer/wyoming/ifc-2018/chapter/1/scope-and-administration#104.9> AND 2021: <https://up.codes/viewer/wyoming/ibc-2021/chapter/1/scope-and-administration#104.11>
- 58 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 (<https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#201.4>) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.
- 59 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1>
- 60 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.
- 61 [2021 IRC Section R318.4](#)
- 62 [2021 IRC Section R316.2](#)