



CERTIFICATION



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Technical Evaluation Report

TER 1803-01

SWD Urethane Quik-Shield 104 Spray
Polyurethane Foam (SPF) and Use in
Unvented Attics & Crawlspace

SWD Urethane

Product:

**SWD Urethane Quik-Shield 104
(QS 104)**

Issue Date:

January 30, 2019

Revision Date:

April 24, 2020

Subject to Renewal:

April 1, 2021





COMPANY
INFORMATION:

SWD Urethane

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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 PRODUCT EVALUATED¹

- 1.1 SWD Urethane Quik-Shield 104 (QS 104)

2 APPLICABLE CODES AND STANDARDS^{2,3}

2.1 Codes

- 2.1.1 *IBC—12, 15, 18: International Building Code®*
- 2.1.2 *IRC—12, 15, 18: International Residential Code®*
- 2.1.3 *IECC—12, 15, 18: International Energy Conservation Code®*

2.2 Standards and Referenced Documents

- 2.2.1 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 2.2.2 *ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics*
- 2.2.3 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*
- 2.2.4 *ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*
- 2.2.5 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*
- 2.2.6 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 2.2.7 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*

¹ Building codes require data from valid [research reports](#) be obtained from [approved sources](#). Agencies who are accredited through ISO/IEC 17065 have met the [code requirements](#) for approval by the [building official](#). DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

Through ANAB accreditation and the [IAF MLA](#), DrJ certification can be used to obtain product approval in any [jurisdiction](#) or country that has [IAF MLA Members & Signatories](#) to meet the [Purpose of the MLA](#) – “certified once, accepted everywhere.”

Building official approval of a licensed [registered design professional](#) (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant [jurisdiction](#). Therefore, the work of licensed RDPs is accepted by [building officials](#), except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the [building official](#) responds in writing stating the reasons for [disapproval](#).

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

² Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., *ASCE 7*, *NDS*, *ASTM*). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

³ All terms defined in the applicable building codes are italicized.



- 2.2.8 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*
- 2.2.9 *UL 723: Test for Surface Burning Characteristics of Building Materials*

3 PERFORMANCE EVALUATION

- 3.1 SWD Urethane QS 104 is evaluated for the following:
 - 3.1.1 Physical properties of the product in accordance with the standards listed in Section 2
 - 3.1.2 Surface burning characteristics complying with the provisions of IBC Section 2603.3 and IRC Section R316.3
 - 3.1.3 Thermal performance (R-values) complying with the provisions of IRC Section N1102 and IECC Section C402
 - 3.1.4 Air permeability in accordance with IRC Section N1102.4, and IECC Sections C402.5 and R402.4
 - 3.1.5 Use in unvented attic spaces and crawlspaces without a thermal barrier in accordance with IBC Section 2603.9⁴ and IRC Sections R316.4 and R316.6
 - 3.1.6 Use without a thermal barrier in accordance with IBC Section 2603.3 and IRC Section R316.3 when International Fireproof Technology, Inc (IFTI) DC315 intumescent coating is applied
- 3.2 Use in fire-resistance rated construction is outside the scope of this TER.
- 3.3 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.4 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 The product evaluated in this TER is shown in Figure 1.



FIGURE 1. SWD URETHANE QS 104 SPF IN UNVENTILATED ATTICS

⁴ 2012 IBC Section 2603.10



- 4.2 SWD Urethane QS 104 is an open-cell Spray Polyurethane Foam (SPF) insulation product.
 - 4.2.1 Density: 0.4 pounds per cubic foot (pcf) (8 kg/m³).
- 4.3 SWD Urethane QS 104 is produced in the field by combining an isocyanate (Component A) with a proprietary resin (Component B).

5 APPLICATIONS

- 5.1 SWD Urethane QS 104 is used in the following applications:
 - 5.1.1 Thermal insulation in buildings constructed in accordance with the *IBC* or *IRC*.
 - 5.1.2 Sealant for penetrations as part of an air barrier system.

5.2 Surface Burning Characteristics

- 5.2.1 SWD Urethane QS 104 has the surface burning characteristics as shown in Table 1.

TABLE 1. SURFACE BURN CHARACTERISTICS OF SWD URETHANE QS 104

Product	Flame Spread	Smoke Developed
SWD Urethane QS 104 ⁽¹⁾	< 25	< 450
1. Tested in accordance with <i>ASTM E84/UL723</i> at a thickness of 4".		

5.3 Thermal Resistance

- 5.3.1 SWD Urethane QS 104 has the thermal resistance as defined in Table 2.

TABLE 2. URETHANE QS 104 THERMAL RESISTANCE PROPERTIES

Thickness (in)	Thermal Resistance (R-values) (h·ft. ² ·°F/Btu) ^{1,2}
1	3.9
3.5	13.0
SI: 1 in = 25.4 mm 1. Tested at a mean temperature of 75° F. 2. R-Values are based on 90-day aged test results.	

5.4 Air Permeability

- 5.4.1 SWD Urethane QS 104 has the air permeability characteristics shown in Table 3 and, therefore, is an air impermeable insulation in accordance with *IRC Sections R202* and *R806.5*.

TABLE 3. URETHANE QS 104 AIR BARRIER MATERIAL PROPERTIES

Product	Air Permeability
SWD Urethane QS 104 ^(1,2)	<0.02 (L/s·m ²) ³
1. Sprayed to a minimum thickness of 3.5" 2. Tested in accordance with <i>ASTM E2178</i> . 3. Liter per second per square meter when tested at a pressure differential of 75 Pa.	





5.5 Unvented Attic and Unvented Enclosed Rafter Assemblies

5.5.1 General:

- 5.5.1.1 SWD Urethane QS 104 is approved for use in unvented attic and unvented, enclosed rafter assemblies in accordance with IBC Section 1202.3⁵ provided the following conditions are met:
 - 5.5.1.1.1 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.
 - 5.5.1.1.2 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.
 - 5.5.1.1.3 Vinyl or other thin plastic flexible ducts/vents may not penetrate the roof deck or gable unless it is covered with minimum SPF of 3.5" (89 mm).
 - 5.5.1.1.4 Other items penetrating the roof deck or gable not specifically named in this TER (other than steel or copper) need to be covered with SPF at a minimum thickness of 3.5" (89 mm).
- 5.5.1.2 SWD Urethane QS 104 shall be separated from the building interior by a thermal barrier consisting of a minimum ½" gypsum wallboard or equivalent in accordance with IBC Section 2603.4 or IRC Section R316.4, except in unvented attics and crawlspaces as described in Sections 5.5.2 and 5.5.3.

5.5.2 Application in an Unvented Attic without a Prescriptive Thermal Barrier or Ignition Barrier:

- 5.5.2.1 When SWD Urethane QS 104 is applied in unvented attics conforming to IRC Section R806.5, the following apply:
 - 5.5.2.1.1 SPF shall be applied to the underside of roof sheathing to a minimum thickness of 3.5" (89 mm).
 - 5.5.2.1.2 Roof rafter or truss top chord member edges may be left exposed.
 - 5.5.2.1.3 SPF shall be applied to vertical wall surfaces to a minimum thickness of 3.5" (89 mm).
 - 5.5.2.1.4 Wall stud edges may be left exposed.
 - 5.5.2.1.5 Maximum thickness of the SPF is 18" (508 mm) on the underside of roof sheathing or on the vertical wall surfaces.
 - 5.5.2.1.6 SPF insulation may be left exposed to the attic without a thermal barrier, prescriptive ignition barrier, or an intumescent coating.
 - 5.5.2.1.7 Attic shall have access complying with IRC Section R807, horizontally placed in the floor, and shall feature one of the following:
 - 5.5.2.1.7.1 A downward-opening hatch,
 - 5.5.2.1.7.2 A pull down stair or,
 - 5.5.2.1.7.3 Access opening in accordance with IRC Section R807 using Rockfon® Pacific™ 201 Square Edge Ceiling Tile to cover the opening. The Rockfon® Pacific™ 201 ceiling tile shall have a maximum density of 8 pcf, a maximum binder content of 3% and shall be listed as a Class A product in accordance with ASTM E1264.
 - 5.5.2.1.8 Vertical access openings are not permitted unless a project specific fire analysis is conducted that justifies its use.

⁵ 2015 IBC Section 1203.3



5.5.2.2 ABS/PVC Vent Pipes

- 5.5.2.2.1 For attics up to 46,080 ft³ (1305 m³), any schedule 40 (minimum) ABS or PVC vent pipe does not need to be covered in SPF.
- 5.5.2.2.2 For attics larger than 46,080 ft³ (1305 m³), schedule 40 (minimum) ABS or PVC vent pipe penetrations shall be covered with SPF at a minimum thickness of 3.5" (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 in² (23,226 mm²).
- 5.5.2.2.3 ABS or PVC vent pipes thinner than schedule 40 (for any attic volume) must be covered with the minimum 3.5" (89 mm) of SPF, 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 in² (23,226 mm²).

5.5.2.3 Flexible Metallic Ducts/Vents/Pipes Penetrating the Roof Deck or Gable

- 5.5.2.3.1 For attics up to 46,080 ft³ (1305 m³), 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 the minimum 3.5" (89 mm) of SPF.
- 5.5.2.3.2 For attics greater than 46,080 ft³ (1305 m³), 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 the minimum 3.5" (89 mm) of SPF, 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 in² (23,226 mm²).

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

- 5.5.2.4.1 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 the minimum 3.5" (89 mm) of SPF.

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

- 5.5.2.5.1 For attics up to 46,080 ft³ (1305 m³), 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.
- 5.5.2.5.2 For attics greater than 46,080 ft³ (1305 m³), 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 the minimum 3.5" (89 mm) SPF.

5.5.3 Application in an Unvented Crawlspace without a Prescriptive Thermal Barrier or Ignition Barrier:

- 5.5.3.1 When SWD Urethane QS 104 is applied in unvented crawlspaces conforming to IRC Section R408.3, the:
 - 5.5.3.1.1 SPF shall be applied to the underside of upper surface to a minimum thickness of 3.5" (89 mm).
 - 5.5.3.1.2 SPF shall be applied to vertical wall surfaces to a minimum thickness of 3.5" (89 mm).
 - 5.5.3.1.3 Wall stud edges may be left exposed.
 - 5.5.3.1.4 Maximum thickness of the SPF is 18" (356 mm) on the underside of the upper surface or on the vertical wall surfaces.
 - 5.5.3.1.5 SPF insulation may be left exposed to the crawlspace without a thermal barrier, prescriptive ignition barrier, or an intumescent coating.
 - 5.5.3.1.6 Crawlspace access shall be provided in accordance with IRC Section R408.4.





- 5.5.3.1.7 Enclosures for items penetrating the upper surface or walls, such as plumbing and venting systems, shall be covered with a minimum of 3.5" (89 mm) of SWD Urethane QS 104 insulation.
- 5.5.4 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.
- 5.6 *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 Intumescent Coating*
 - 5.6.1 SWD Urethane QS 104 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.
 - 5.6.2 When DC315 is applied to QS 104 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 SWD URETHANE QS 104 SPF

Product	IFTI Product Name	Maximum Thickness of QS104 on Walls and Vertical Surfaces (in) (mm)	Maximum Thickness on Ceilings, Underside of Roof Sheathing/Rafters & Floors (in) (mm)	Application of IFTI Coating
SWD Urethane QS 104	DC315	8 (203)	14 (356)	18 mils wet (12 mils dry)

SI: 1 in = 25.4 mm

6 INSTALLATION

- 6.1 Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.2 SPF insulation shall be applied by licensed dealers and installers certified by SWD Urethane.
- 6.3 SWD Urethane QS 104 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.
- 6.4 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.
- 6.5 SWD Urethane QS 104 is intended for interior use only and is not to be used where it could come in contact with water. Provide protection from weather during and after installation.
- 6.6 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*.
- 6.7 SWD Urethane QS 104 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.
- 6.8 Do not use SWD Urethane QS 104 inside of electrical or junction boxes.
- 6.9 SWD Urethane QS 104 shall be installed only when the temperature is at or above 14°F (-10°C).
- 6.10 Insulation shall not be installed in areas where the service temperature is greater than 180°F (82°C).
- 6.11 For general SPF installation guidelines, see the American Chemistry Council's Guidance on Best Practices for the Installation of Spray Polyurethane Foam.

⁶ 2015 IBC Section 803.1.2.1





7 TEST ENGINEERING SUBSTANTIATING DATA

- 7.1 Testing and data determining the material properties of SWD Urethane QS 104 by QAI Laboratories, Inc
- 7.2 Testing showing surface burning characteristics in accordance with *ASTM E84* by QAI Laboratories, Inc
- 7.3 Testing as an air barrier material in accordance with *ASTM E2178* by QAI Laboratories, Inc
- 7.4 Fire testing and analysis of SWD QS 104 with IFTI DC315 Intumescent Coating in accordance with *NFPA 286*, performed by QAI Laboratories, Inc
- 7.5 Engineering analysis of cone calorimeter testing of SWD QS 104 foam for use in unvented attics and equivalency to QS 106 by Priest & Associates Consulting, LLC
- 7.6 Engineering analysis justifying omittance of requirement to cover entire length of items penetrating roof deck with 3½ inches (89 mm) of SWD QS 106 or QS 108 by Priest & Associates Consulting, LLC
- 7.7 Engineering analysis of Rockfon® Pacific™ 201 ceiling panels by Priest & Associates Consulting, LLC
- 7.8 Engineering analysis of use of SWD QS 106 SPF in unvented attics without an ignition barrier
- 7.9 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC Section 1703* and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.
- 7.10 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC*, *IRC*, *NDS*®, and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8 FINDINGS

- 8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:
 - 8.1.1 Surface burning characteristics complying with the provisions of *IBC Section 2603.3* and *IRC Section R316.3*
 - 8.1.2 Thermal performance (R-values) complying with the provisions of *IRC Section N1102* and *IECC Section C402*
 - 8.1.3 Air permeability in accordance with *IRC Section N1102.4*, and *IECC Sections C402.5⁷* and *R402.4*
 - 8.1.4 Use in unvented attic spaces and crawlspaces without a thermal barrier in accordance with *IBC Section 2603.9⁸* and *IRC Sections R316.4* and *R316.6*
 - 8.1.5 Use without a thermal barrier in accordance with *IBC Section 2603.3* and *IRC Section R316.3* when IFTI DC315 intumescent coating is applied

⁷ 2012 IECC Section C402.4

⁸ 2012 IBC Section 2603.10



8.2 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.9 are similar) states:

104.11 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 has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code...Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

8.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.

8.3.1 No known variations

9 CONDITIONS OF USE

9.1 SWD Urethane QS 104 insulation described in this TER comply with, or are suitable alternatives to, what is specified in the codes listed in Section 2, subject to the following conditions:

- 9.1.1 The manufacturer's installation instructions and this TER shall be available on the jobsite for inspection.
 - 9.1.2 The SPF insulation shall be installed in accordance with the manufacturer's published installation instructions, this TER and the applicable code. If there is a conflict between the installation instructions and this TER, the more restrictive governs.
 - 9.1.3 The SPF insulation shall be separated from the interior of the building by an approved 15-minute thermal barrier, except as noted in this TER.
 - 9.1.4 When installed in unvented attics without a code-prescribed ignition barrier or thermal barrier, the installation shall meet the conditions outlined in Section 5.5.
 - 9.1.5 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.
 - 9.1.6 The SPF insulation shall meet the minimum thicknesses and densities noted in this TER.
 - 9.1.7 The SPF insulation shall be protected from the weather during and after application.
 - 9.1.8 The SPF insulation shall be applied by SWD Urethane approved dealers and installers.
 - 9.1.9 Use of the SPF insulation in areas where the probability of termite infestation is "very heavy" shall be in accordance with IBC Section 2603.8⁹ and IRC Section R318.4 as applicable.
 - 9.1.10 Jobsite certification and labeling of the SPF insulation shall comply with IRC Section N1101.10.1 and N1101.10.1.1 and IECC Section C303.1.1 and C303.1.1.1.
 - 9.1.11 A vapor retarder shall be installed in accordance with the applicable code.
 - 9.1.12 The components used to produce SWD Urethane QS 104 are manufactured in Mesa, AZ, under a quality control program with inspections in accordance with IBC Section 2603.2 and IRC Section R316.2.
- 9.2 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of *permit* application.
- 9.3 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

⁹ 2012 IBC Section 2603.9





- 9.4 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the Building Designer (e.g., owner or registered design professional).
- 9.5 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.6 This product is manufactured under a third-party quality control program in accordance with IBC Section 104.4 and 110.4 and IRC Section R104.4 and R109.2.
- 9.7 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent. Therefore, the TER shall be reviewed for code compliance by the building official for acceptance.
- 9.8 The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the building official's inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

- 10.1 The product(s) listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at swdurethane.com.

11 REVIEW SCHEDULE

- 11.1 This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.

