

STAYCELL[®] HYBRID HFO INTUMESCENT SPRAY FOAM SYSTEM

DESCRIPTION:

The **HYBRID HFO System** consists of two separate layers: **Staycell[®] 504** closed-cell, spray polyurethane foam insulation (base layer) covered with **Staycell ONE STEP[®] 502** closed-cell, intumescent, spray polyurethane foam insulation as the exposed surface layer. This system is formulated with highly insulating **HFO** blowing agents and is used to insulate building components such as roof decks, ceilings, walls, siding, structural steel and tanks to provide an integral air barrier / insulation / vapor retarder for building envelope assemblies.

Benefits of the **HYBRID HFO SYSTEM** include:

- Low GWP
- Air Impermeable at 1/2"
- Water Resistive Barrier (AC71) @ 1"
- Class II Vapor Retarder @ 1"
- Low VOC, CDPH Standard V 1.2, 2017
- High Yields
- Controls Air Infiltration
- Structural Enhancement
- Superior Insulation

TYPICAL PROPERTIES – STAYCELL[®] 504 (BASE LAYER)⁽¹⁾

PROPERTY	METHOD	VALUE
Density, core (pcf @ 2" lifts)	ASTM D 1622	1.7
Compressive Strength (psi)	ASTM D 1621	21
Tensile Strength (psi)	ASTM D 1623	62
Closed Cell Content (%)	ASTM D 6226	>90
Air Permeance (1/2" @ 75 Pa)	ASTM E 2178	0.001 cfm/ft ²
Surface Burning Characteristics		
Flame Spread	ASTM E 84	≤ 25
Smoke Developed	ASTM E 84	≤ 450
Potential Heat (Btu/ft ² /inch)	NFPA 259	1,834
Max Service Temperature		180°F

R-VALUE AND WATER VAPOR PERMEABILITY⁽¹⁾⁽²⁾

Thickness (inches)	R-value*** (°F·hr·ft ² / Btu)	Moisture Vapor Permeance***
1	7.0	0.95
2	14	0.47
3	20	0.32
3.5	23	0.27
5.5	37	0.17
6	40	0.16
7	47	0.14
8	53	0.12
9.5	64	0.10

*As with all insulating materials, the R-value will vary with age and use conditions.
 **ASTM C 518
 ***ASTM E 96

TYPICAL PROPERTIES – STAYCELL ONE STEP[®] 502 (TOP LAYER)⁽¹⁾

PROPERTY	METHOD	VALUE
Density, core (pcf @ 2" lifts)	ASTM D 1622	2.0
Compressive Strength (psi)	ASTM D 1621	22
Tensile Strength (psi)	ASTM D 1623	55
Closed Cell Content (%)	ASTM D 6226	>90
Thermal Resistance (aged) R-value (°F·hr·ft ² / Btu) ⁽²⁾	ASTM C 518	5.7 @ 1"
Water Vapor Transmission Permeance (perms)	ASTM E 96	0.99 @ 3.5"
Air Permeance (1" @ 75 Pa)	ASTM E 2178	0.002 cfm/ft ²
Surface Burning Characteristics		
Flame Spread	ASTM E 84	≤ 25
Smoke Developed	ASTM E 84	≤ 450
Potential Heat (Btu/ft ² /inch)	NFPA 259	1,881
Max Service Temperature		180°F

For proper use of this material, refer to the Staycell[®] 504 and Staycell ONE STEP[®] 502 technical data sheets, installation guides and any of the following codes or documents:

- 2012, 2015, 2018 and 2021 International Building Code, Chapter 26 or International Residential Code R316 & R806
- API Fire Safety Guidelines for Use of Rigid Polyurethane and Polyisocyanurate Foam Insulation in Building Construction (AX230)
- SPFA-126 Thermal and Ignition Barriers for the Spray Polyurethane Foam Industry

Exposed spray polyurethane foam is sensitive to ultraviolet light (UV) and will change color over time depending on exposure but can be easily painted with latex paints to color match adjacent surfaces. Contact PSI for paint recommendations.

(1) These physical property values are typical for this material as applied at our development facility under controlled conditions. SPF performance and actual physical properties will vary with differences in application (i.e. ambient conditions, process equipment and settings, material throughput, etc). As a result, these published properties should be used as guidelines solely for the purpose of evaluation. Physical property specifications should be determined from actual production material. The above data was collected from samples prepared using equipment configurations pertinent to lab conditions.

(2) The data chart shows the R-value of this insulation. "R" means resistance to heat flow. The higher the R-value, the greater the insulating power. Compare insulation R-values before you buy. There are other factors to consider. The amount of insulation will depend upon the climate, the type and size of the building. If you buy too much insulation it will cost you more than what you will save on fuel. To achieve proper R-values, it is essential that this insulation be installed properly.

Polyurethane products manufactured or produced from this liquid system may present a serious fire hazard if improperly used. The character and magnitude of any such hazard will depend on a broad range of factors, which are controlled and influenced by the manufacturing and production process, by the mode of application or installation and by the function and usage of the particular product. **Any flammability rating contained in this literature is not intended to reflect hazards presented by this or any other material under actual fire conditions. These ratings are used solely to measure and describe the product's response to heat and flame under controlled laboratory conditions.** Each person, firm or corporation engaged in the manufacture, production, application, installation or use of any polyurethane product must carefully determine whether there is a potential fire hazard associated with such product in a specific usage and whether such usage complies with the applicable building code.

STAYCELL® HYBRID HFO INTUMESCENT SPRAY FOAM INSULATION SYSTEM

GENERAL INFORMATION:

The HYBRID HFO System spray polyurethane foam (SPF) system is intended for installation by qualified contractors trained in the processing and application of SPF systems, as well as the plural-component polyurethane dispensing equipment required to do so. Contractors and applicators must comply with all applicable and appropriate storage, handling, processing and safety guidelines. PSI technical service personnel should be consulted in all cases where application conditions are questionable.

For detailed technical and application information/instructions, refer to the separate technical data sheets and installation guides for the Staycell® 504 and Staycell ONE STEP® 502 products. Both products are formulated for maximum yield. Actual yield is based on factors affecting density including, but not limited to: multiple lifts, substrate texture, substrate temperature, overspray loss, windy conditions, altitude, container residue, equipment characteristics & temperatures, applicator technique, etc. For help estimating yield for this and other spray foams, please consult Spray Polyurethane Foam Alliance's SPFA-121 SPF Estimating Reference Guide.

CAUTIONS AND RECOMMENDATIONS:

The HYBRID HFO System is NOT designed for use as an EXTERIOR roofing system. PSI offers a separate line of products for exterior roofing applications. For more information, please contact your sales representative.

Cold-storage structures such as coolers and freezers require special design considerations with regard to thermal insulation and moisture/vapor drive. The HYBRID HFO System should NOT be installed in these types of constructions unless the structure was designed by a design professional for specific use as cold storage.

The HYBRID HFO System is designed for installation onto most standard construction materials such as wood, wood-based products, plastics, metal and concrete. The HYBRID HFO System has performed successfully when sprayed onto wood substrates down to 40°F using special cold weather application techniques. For heat sink-materials such as metal or concrete, the HYBRID HFO System can be sprayed onto substrates down to 40°F, using a flash pass method. PSI recommends the use of mock ups or sample spray before starting the full-scale project. This will provide an opportunity to see how all materials are installed and evaluate their properties prior to proceeding.

In addition to reading and understanding the SDS, all contractors and applicators must use appropriate respiratory, skin and eye Personal Protective Equipment (PPE) when handling and processing polyurethane chemical systems. Personnel should

review the following documents published by Spray Polyurethane Foam Alliance (SPFA): AX-171 Course 101-R Chapter 1: Health, Safety and Environmental Aspects of Spray Polyurethane Foam and Coverings.

www.spraypolyurethane.org

Also, the following document is available from the Center for the Polyurethanes Industries (CPI): Model Respiratory Protection Program for Compliance with the Occupational Safety and Health Administration's Respiratory Protection Program Standard 29 C.F.R. §1910.134.

As with all SPF systems, improper application techniques should be avoided. Examples of improper application techniques include, but are not limited to, excessive thickness of SPF, off-ratio material and spraying into or under rising SPF. Potential results of improperly installed SPF include: dangerously high reaction temperatures that may result in fire and offensive odors that may or may not dissipate. Improperly installed SPF must be removed and replaced with properly installed materials.

Large masses of SPF should be removed to an outside safe area, cut into smaller pieces and allowed to cool before discarding into an appropriate trash receptacle. SPF insulation is combustible. High-intensity heat sources such as welding or cutting torches should not be used in contact with the HYBRID System. The insulation must not be used in areas that have a maximum service temperature greater than 180°F (82°C).

SHELF LIFE AND STORAGE CONDITIONS:

Both products comprising the HYBRID HFO System have a shelf life of approximately six (6) months from the date of manufacture when stored in original, unopened containers at 65°F- 85°F. As with all industrial chemicals this material should be stored in a covered, secure location and never in direct sunlight. Storage temperatures above the recommended range will shorten shelf life. Storage temperatures above the recommended range may also result in elevated headspace pressure within packages.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY:

The information herein is to assist customers in determining whether our products are suitable for their applications. Our products are only intended for sale to industrial and commercial customers. Customer assumes full responsibility for quality control, testing and determination of suitability of products for its intended application or use. We warrant that our products will meet our written liquid component specifications. We make no other warranty of any kind, either express or implied, by fact or law, including any warranty of merchantability or fitness for a particular purpose. Our total liability and customer's exclusive remedy for all proven claims is replacement of nonconforming product and in no event shall we be liable for any other damages.

While descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, they are provided for guidance only. Because many factors may affect processing or application/use, PSI recommends that the user determine suitability of the product for a particular purpose prior to use. No warranties of any kind, either expressed or implied, including warranties of merchantability or fitness for a particular purpose, are made regarding products described or designs, data or information set forth, or that the products, designs, data or information may be used without infringing the intellectual property rights of others. In no case shall the descriptions, information, data or designs provided be considered a part of PSI's terms and conditions of sale. Further, the descriptions, designs, data, and information furnished by PSI hereunder are given gratis and PSI assumes no obligation or liability for the description, designs, data or information given or results obtained, all such being given and accepted at the user's risk.

Warning: These products can be used to prepare a variety of polyurethane products. Polyurethanes are organic materials and must be considered combustible.

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COMPLIANCE WITH INTERNATIONAL BUILDING CODES (IBC) AND INTERNATIONAL RESIDENTIAL CODES (IRC):

The HYBRID HFO System passes the UL 1715 large-scale, enclosed-room fire test listed in the Special Approval subsection of SECTION 2603 of the IBC and SECTION R316 of the IRC when installed exposed as shown in the table below. These assemblies are termed *Alternative Thermal Barrier Assemblies* and are considered acceptable alternates to the ½" gypsum board prescriptive thermal barrier requirements.

The HYBRID HFO System are also qualified *Alternative Thermal Barrier Assemblies* when installed in an exposed condition in accordance with ICC 1100-2019 Standard for Spray-Applied Polyurethane Foam Plastic Insulation and IAPMO/ANSI ES 1000-2020 Standard for Building Code Compliance of Spray-Applied Polyurethane Foam based on passing UL 1715.



LISTING NO. B1020-1

Staycell® 504 / Staycell ONE STEP® 502 HYBRID HFO Intumescent Spray Foam Insulation System

Fire performance in accordance with ASTM E-84:

Staycell® 504 spray foam insulation (base layer):

Tested thickness: 4 inches Flame spread index: ≤ 25 Smoke developed index: ≤ 450

Staycell ONE STEP® 502 intumescent spray foam insulation (exposed surface layer):

Tested thickness: 4 inches Flame spread index: ≤ 25 Smoke developed index: ≤ 450

Qualification as an *Alternative Thermal Barrier Assembly* when installed exposed; no thermal barrier or ignition barrier required based on compliance with UL1715 large-scale, enclosed-room fire test standard:

Exposed applications on walls only:

Assembly: Staycell® 504 base layer installed at nominal 3 inch or less thickness covered with nominal 1 inch thick Staycell ONE STEP® 502 as the exposed surface layer.

Exposed applications on the underside of roofs/floors/ceilings only:

Assembly: Staycell® 504 base layer installed at nominal 8 inch or less thickness covered with nominal ½ inch thick Staycell ONE STEP® 502 as the exposed surface layer.

The Staycell® HYBRID HFO System was fire tested separately for installation exposed on either walls or the underside of ceilings/roofs only. AS A RESULT, IT IS NOT TO BE INSTALLED EXPOSED ON ENTIRE WALLS AND ENTIRE ROOFS/FLOORS/CEILINGS WHEN ADJACENT TO EACH OTHER. Contact PSI for tested wall/roof transition applications.

QAI Laboratories, Ltd. (QAI) is accredited by International Accreditation Services, Inc., a division of the International Code Council that publishes the International Building Code and International Residential Code. QAI is accredited for fire testing, quality control inspections of manufacturing facilities and certification of listed and labeled products in accordance with IAS Registration Nos. AA-723, TL-220 and PCA-119.



STAYCELL® HYBRID HFO INTUMESCENT SPRAY FOAM INSULATION SYSTEM

TABLE 1

NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

STAYCELL® 504 / STAYCELL ONE STEP® 502 HYBRID HFO INTUMESCENT SPRAY FOAM SYSTEM APPLIED IN WALL CAVITY

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System – Use either: 1 with the interior, steel studs, minimum 3½-inch depth, minimum No. 20-gauge at a maximum of 24-inch on center with lateral bracing every 4 feet vertically, or 2 or 3	1 - 1 layer of ½-inch thick Type X exterior gypsum sheathing installed on the exterior side of the steel studs 2 - Concrete wall - minimum 2 inch thick 3 - Concrete masonry wall
Floor-Line Firestopping	4 lb/ft ³ mineral wool (e.g. Thermafiber) friction-fit in each wall stud cavity at each floor-line. Mineral wool is not required in stud cavities at floor-line when infill floor-line construction ¹ is employed for exterior wall.
Cavity Insulation - Use either 1 or combination of 1 and 2	1 - Full cavity depth or less of Staycell® HYBRID HFO System using sheathing, concrete or masonry as substrate and covering the width of the cavity and inside the stud flange. 2 - Any noncombustible insulation (if batts, can be either faced or unfaced)
Interior Gypsum Wallboard	1 - Minimum ½-inch thick Type X gypsum wallboard
Exterior Wall Covering – Use either 1, 2 or 3 with Note 4.	1 - Any non-combustible exterior wall covering material 2 - Any combustible exterior wall covering system that has successfully been tested in accordance with NFPA 285. 3 - Any combustible exterior wall covering system up to a maximum wall height of 40 feet above grade plane. If the combustible material is fire retardant treated wood, the maximum wall height can be 60 feet above grade plane. 4 - For base wall 2 or 3, a covering is optional but not required. Use an exterior wall covering as described in 1, 2 or 3 above.
Window/Door Perimeters	Framed as required for the base wall. Use No. 25-gauge (minimum) sheet steel for flashing area outside of the base wall.

¹. Infill stud wall construction refers to the condition where the stud framing of an exterior wall is interior to the floor line slab edges, effectively terminating the stud cavity at each floor-line and creating sectioned stud bays in between sequential floors.



STAYCELL® HYBRID HFO INTUMESCENT SPRAY FOAM INSULATION SYSTEM

TABLE 2

NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

STAYCELL® 504 / STAYCELL ONE STEP® 502 HYBRID INTUMESCENT SPRAY FOAM SYSTEM APPLIED TO EXTERIOR OF WALL ASSEMBLIES

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System - Use either 1, 2 or 3	<p>1 - Concrete wall - minimum 2-inch thick</p> <p>2 - Concrete masonry wall</p> <p>3 - One layer of 5/8-inch thick Type X gypsum wallboard on the interior, installed over steel studs: minimum 3 5/8-inch depth, minimum 20-gauge at a maximum of 24 inches on center with lateral bracing every 4 feet vertically</p>
Floor-Line Firestopping	4 lb/ft ³ mineral wool (e.g. Thermafiber) in each stud cavity and at each floor-line – attached with Z-clips or equivalent. Mineral wool is not required in stud cavities at floor-lines when infill stud-wall construction ¹ is employed for exterior wall construction.
Cavity Insulation - Use either 1 or combination of 1 and 2	<p>1 - Full cavity depth or less of Staycell® HYBRID HFO System using sheathing as substrate and covering the width of the cavity and inside the stud flange.</p> <p>2 - Any non-combustible insulation (if batts, may be faced or unfaced)</p>
Exterior Sheathing - Use either 1 or 2	<p>1 - 1/2-inch thick, exterior type gypsum sheathing</p> <p>2 - 5/8-inch thick, exterior type gypsum sheathing</p>
Exterior Insulation - Use either 1 or 2	<p>1 - None</p> <p>2 - Staycell® HYBRID HFO System - Total thickness to be a maximum of nominal 4 inches</p>
Exterior Wall Covering Use either 1, 2, 3, 4, 5 or 6	<p>1 - Brick - Standard nominal 4-inch thick, clay brick. Installed with brick veneer anchors - standard types - installed maximum 24 inches OC vertically on each stud. A maximum 2-inch air gap between exterior insulation and brick.</p> <p>2 - Stucco - Minimum 3/4-inch thick, exterior cement plaster and lath. The secondary water-resistive barrier (WRB) may be installed between the exterior insulation and the lath. The secondary WRB shall not be full-coverage asphalt or butyl-based self-adhered membranes.</p> <p>3 - Minimum 2-inch thick Limestone, natural stone, or minimum 1 1/2-inch thick cast artificial stone. Any standard non-open jointed installation technique such as shiplap, etc. may be used.</p> <p>4 - Terracotta Cladding – Use any terracotta cladding system in which the terracotta is a minimum of 1 1/4-inches thick. Any standard non-open-jointed installation technique such as shiplap, etc. may be used.</p> <p>5 - Minimum 1-inch thick, Clark Pacific glass-fiber-reinforced-concrete (GFRC) panels. Standard installation techniques may be used. Staycell® HYBRID HFO System sprayed onto the interior face of the GFRC panel up to a maximum of 4 inches.</p> <p>6 - Minimum 1-inch thick, Gates Precast Liter precast panels. Standard installation techniques may be used. Staycell® HYBRID HFO System sprayed onto the interior face of the precast concrete panels up to a maximum of 4 inches.</p>
Window/Door Perimeters	Framed as required for the base wall. Use No. 25 gauge (minimum) sheet steel for flashing area outside of the base wall.

¹. Infill stud wall construction refers to the condition where the stud framing of an exterior wall is interior to the floor line slab edges, effectively terminating the stud cavity at each floor-line and creating sectioned stud bays in between sequential floors.

