

STAYCELL® 504-2.0 HFO SPRAY FOAM INSULATION

DESCRIPTION:

Staycell® 504-2.0 HFO is a two-component, self-adhering, seamless, closed-cell, spray-applied polyurethane foam system. This product is formulated with highly insulating HFO blowing agents and is used to insulate building components such as roof decks, ceilings, walls, siding, floors, structural steel and tanks to provide an integral air barrier / insulation / vapor retarder for building envelope assemblies.

The benefits of **Staycell® 504-2.0 HFO** include:

- Low GWP
- High R-Value
- High Yield
- Air Impermeable Insulation at ½"
- Class II Moisture Vapor Retarder @ 1.3"
- FEMA Flood Resistance - Class 5
- Water Resistive Barrier (AC71) @ 1"
- Compliant with ASTM C1029, IAPMO ES1000 & ICC 1100
- Low VOC per CDPH Standard V 1.2, 2017

REACTIVITIES AVAILABLE	AMBIENT TEMPERATURE RANGE
REG	50°F to 120°F
FAST	10°F to 60°F

TYPICAL PHYSICAL PROPERTIES⁽¹⁾

PROPERTY	METHOD	VALUE
Density, core (pcf @ 2" lifts)	ASTM D1622	2.0
Compressive Strength (psi)	ASTM D1621	28
Tensile Strength (psi)	ASTM D1623	45
Closed Cell Content (%)	ASTM D6226	>90
Air Permeance (1" @ 75 Pa)	ASTM E2178	≤0.02 cfm/ft²
Surface Burning Characteristics		
Flame Spread	ASTM E84	≤ 25
Smoke Developed	ASTM E84	≤ 450
Potential Heat (Btu/ft²/inch)	NFPA 259	1,834
Max Service Temperature		180°F
Bacterial & Fungal Growth	ASTM C1338	No growth
STC	ASTM E90	31³
OITC		24³

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 paint to color match adjacent surfaces. Contact PSI for recommendation(s).

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

Thickness (inches)	R-value*** (°F·hr·ft² / Btu)	Moisture Vapor Permeance***
1	7.1	1.3
2	14	0.65
3	20	0.43
3.5	23	0.37
4.5	30	0.29
5.5	37	0.24
6	40	0.22
7	47	0.19
8	53	0.16
9	60	0.14

*As with all insulating materials, the R-value will vary with age and use conditions.

**ASTM C 518

***ASTM E 96

For proper use of this material, refer to the Staycell® 504-2.0 HFO technical data sheet, installation guide and any of the following codes or documents:

- 2015, 2018, 2021 & 2024 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

(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.

(3) As measured in a 2" x 4" studwall assembly.

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® 504-2.0 HFO SPRAY FOAM INSULATION

STORAGE AND USE OF CHEMICALS:

Staycell® 504-2.0 should be between 65°F and 85°F for proper processing through the spray equipment. Chemicals shipped during winter or summer months may need extra time in moderate temperature storage to stabilize within the proper application range. Cold chemicals can cause poor mixing, pump cavitation or other process problems due to higher viscosity at lower temperatures. Excessively warm chemicals should be cooled prior to opening the drums. Do not store in direct sunlight. Keep drums tightly closed when not in use. When properly stored, the unopened drums of Staycell® 504-2.0 A-Isocyanate have a shelf life of 24 months and Staycell® 504-2.0 B-Resin have a shelf life of 6 months.

SAFE HANDLING OF LIQUID COMPONENTS:

Use caution in removing bungs from the container. Loosen the small bung first to allow any built-up vapor pressure to stabilize before completely removing. **B component will froth at elevated temperatures.** Avoid prolonged breathing of vapors. In case of chemical contact with eyes, flush with water for at least 15 minutes and get medical attention. For further information refer to www.spraypolyurethane.org, Resources box, "Health and Safety Product Stewardship Workbook for High-Pressure Application of SPF".

APPLICATION GUIDELINES:

Staycell® 504-2.0 is suitable for application to most construction materials including wood, masonry, concrete, and metal. Application can be to the exterior or interior side of wall surfaces. To ensure proper adhesion, all substrate surfaces should be dry, clean of dust or flaking surface rust, ice or frost. All metal surfaces must be free of oil, grease, etc. Uncoated metals may require a primer coat. No flammable chemicals, such as wasp and hornet sprays, should be sprayed in the area of the foam application 24 hours before the application. No such chemical should be sprayed after the foam application until the foam has cooled to room temperature.

APPLICATION AROUND PLASTIC PIPES:

Staycell® 504-2.0 can be applied in contact with PVC, CPVC, ABS, PP-R and PEX plastic pipes under the following conditions: 1. The pipes must not be pressurized during the foam application. 2. The foam pass applied in contact with the pipe should not exceed 2" thick in order to prevent excessive exothermic heat at the pipe-to-foam interface. 3. Allow a two minute cooling period between each additional foam pass.

APPLICATION AROUND ELECTRICAL WIRES:

Staycell® 504-2.0 can be applied in contact with electrical wires. Spray foam applicators must spray the foam in such a manner that the expanding foam does not stretch and distort the wires. Light gauge wires which will be encapsulated in the foam layer should have the foam installed behind the wires and allowed to cool prior to applying a top layer to cover the wire. Use a shallow lift of 3/4" of foam to cover the wire. Wait the required two minutes between passes when adding more foam thickness to achieve the desired R-value.

APPLICATION PASS THICKNESS:

Spraying foam will generate heat. Foam which is applied too thick in single passes will increase temperatures which will degrade cell structure and not produce foam with optimum properties. In the most extreme case,

Staycell® 504-2.0 can reach dangerously high temperatures inside the finished foam which can lead to splitting, charring, or even spontaneous combustion. The maximum pass thickness for Staycell® 504-2.0 is four (4) inches. Wait until temperature of the core has dropped to 100°F before adding additional foam passes to achieve required R-value.

VENTILATION OF SPRAY AREA:

Spraying foam will generate mist and fumes with a distinct odor. For interior applications the building area must be vented with fresh air to dissipate the odor. The amount of air flow and time for venting will vary based on each situation. A closed attic area may require fans to force air into and out of the space. An open building that does not have the doors and windows installed may have sufficient air flow to vent the odor fairly quickly. Reentry time for closed-in areas being vented with fans is typically 12-24 hours depending on ventilation rate. Other workers should remain out of the immediate area during this venting time period.

EQUIPMENT AND COMPONENT RATIOS:

Staycell® 504-2.0 must be sprayed with plural component proportioning pump designed for polyurethane spray foam. The proportioning pump ratio is 1 to 1 by volume. The preheater and hose temperature should be set at approximately 120°F and adjusted accordingly to give a good pattern. Due to equipment variations, the application temperature settings may be adjusted to achieve a good spray pattern. For higher-pressure settings above 1,000 psi, temperature settings can be slightly lower.

SURFACE APPLICATION TEMPERATURES & REACTIVITIES:

The surface receiving foam application should be between 30°F and 120°F when applying Staycell® 504-2.0. Adhesion will typically be better on warmer substrates. For applications below 40°F, please refer to the cold weather processing guidelines.

WEATHER PROTECTION OF FINISHED FOAM ON EXTERIOR APPLICATIONS:

The finished surface of sprayed polyurethane foam should be protected from adverse effects of ultraviolet (UV) rays of direct sunlight, which can cause dusting and discoloration. Protective coatings designed for use with polyurethane foam are available. On exterior applications where a veneer or cladding is to be installed, Staycell® 504-2.0 may be exposed to UV light for up to 6 months.

BACTERIAL AND FUNGUS RESISTANCE:

Staycell® 504-2.0 is naturally able to inhibit growth of bacteria and fungus (mold) per ASTM C1338. The anti-microbial properties do not protect occupants of spaces insulated with Staycell® 504-2.0 from potential deleterious effects of molds, mold spores, or disease organisms that may be present in the environment.

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.

STAYCELL® 504-2.0 HFO SPRAY FOAM INSULATION

OTHER APPLICATION AND SAFETY CONSIDERATIONS:

Before spray polyurethane foam is applied, there are many safety and application situations to consider. All spray foam applicators must evaluate the job prior to beginning the spray foam application. It is impossible to anticipate every issue and provide explicit guidance in this product data sheet. If there is a question regarding some aspect of the planned application, consult with PSI for more guidance. The American Chemistry Council (ACC), the Center for Polyurethanes Industry (CPI) and the Spray Polyurethane Foam Alliance (SPFA) also publish information regarding the safe handling and application of spray foam chemicals.

FIRE RATINGS - INTERNATIONAL BUILDING CODES (IBC) AND INTERNATIONAL RESIDENTIAL CODES (IRC):

Staycell® 504-2.0 has Class A flame spread and smoke developed ratings per ASTM E-84 and can be installed in unlimited thickness in walls and ceilings when covered with a prescriptive 15-minute thermal barrier (1/2" gypsum board). Alternatively, Staycell® 504-2.0 is classified as an *Alternative Thermal Barrier Assembly* when installed in accordance with Table 1 & 2 below. For more information, refer to the following codes and documents:

- International Building Code (IBC), Chapter 26
- International Residential Code (IRC), Sections R316 and R806
- SPFA-126, Thermal Barriers & Ignition Barriers for the Spray Polyurethane Industry
- API Fire Safety Guidelines for Use of Rigid Polyurethane and Polyisocyanurate Foam Insulation in Building Construction (AX230)
- QAI Listing Report #B1020-1

TABLE 1 - USE WITHOUT A PRESCRIPTIVE THERMAL BARRIER - STAYCELL® HYBRID SYSTEM

Insulation Type	Maximum Thickness - Base Layer (Walls)	Maximum Thickness – Base Layer (Ceilings, Underside of Roofs/Rafters & Floors)	Fire-Protective Covering Thickness & Type	Test Method
Staycell® 504-2.0	3"	None*	1" Staycell ONE STEP® 502	UL 1715
Staycell® 504-2.0	None*	8"	½" Staycell ONE STEP® 502	UL 1715

*The Staycell® HYBRID System was fire tested separately for installation exposed on either walls only or ceilings, underside of roofs/rafters or floors only. AS A RESULT, IT IS NOT TO BE INSTALLED EXPOSED IN THE COMBINED CONFIGURATION. Contact PSI for tested wall/roof transition applications.

TABLE 2 - USE WITHOUT A PRESCRIPTIVE THERMAL BARRIER - STAYCELL® 504-2.0 & NO-BURN PLUS ThB INTUMESCENT COATING

Insulation Type	Maximum Thickness (Walls)	Maximum Thickness (Ceilings, Underside of Roofs/Rafters & Floors)	Fire-Protective Covering Thickness & Type	Test Method
Staycell® 504-2.0	6.5"	9.5"	No-Burn Plus ThB @ 14 wet mils	UL 1715

STAYCELL® 504-2.0 HFO SPRAY FOAM INSULATION

TABLE 3

NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

STAYCELL® 504-2.0 HFO APPLIED IN WALL CAVITY OR AS INTERIOR INSULATION

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System (BWS) - 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 - One layer ½-inch thick Type X exterior gypsum sheathing installed on exterior side of steel studs 2 - Concrete wall - minimum 2-inch thick 3 - Concrete masonry wall (CMU)
Floor-Line Firestopping	4 lb/ft³ 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 construction.
Cavity Insulation & Interior Wall Covering - Use either 1 or 2 or 1 and 3	1 - Full cavity depth or less of Staycell® 504-2.0 HFO using BWS 1, 2 or 3 and covering the width of the cavity and inside the stud flange. Interior wall covering shall be minimum ½-inch thick Type X gypsum wallboard. 2 - Where the Staycell® HYBRID System (Staycell® 504-2.0 HFO covered with Staycell ONE STEP® 502 HFO) is left exposed to building interior, thickness shall be limited to maximum four (4) inches using BWS 2 or 3 as substrate and covering the width of the cavity and inside the stud flange. 3 - Any non-combustible insulation (if batts, may be faced or unfaced)
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 BWS 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® 504-2.0 HFO SPRAY FOAM INSULATION

TABLE 4

NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

STAYCELL® 504-2.0 HFO APPLIED TO EXTERIOR SIDE OF BASE WALL SYSTEM

WALL COMPONENT	MATERIAL DESCRIPTION
Base Wall System (BWS) - Use either 1, 2 or 3	1 - Concrete wall - minimum 2-inch thick 2 - Concrete masonry wall (CMU) 3 - One layer 5/8-inch thick Type X gypsum wallboard on the interior, installed over steel studs: minimum 3 5/8-inch depth, minimum No. 20-gauge at a maximum of 24 inches on center with lateral bracing every 4 feet vertically.
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, 2 or 3 or combination of 2 and 3	1 - None 2 - Full cavity depth or less of Staycell® 504-2.0 HFO using BWS 1, 2 or 3 and covering the width of the cavity and inside the stud flange. 3 - Any non-combustible insulation (if batts, may be faced or unfaced)
Interior Wall Covering	5/8-inch thick Type X gypsum wallboard
Exterior Sheathing - Use either 1 or 2	1 - For BWS 3, 1/2-inch thick, exterior type gypsum sheathing 2 - For BWS 3, 5/8-inch thick, exterior type gypsum sheathing
Exterior Insulation	Staycell® 504-2.0 HFO - total thickness to be maximum of nominal four (4) inches.
Exterior Wall Covering Use either 1, 2, 3, or 4	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. 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. 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. 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.
Window/Door Perimeter Protection Use either 1 or 2	Where openings in exterior walls occur (i.e. windows, doors, etc.), the gap between the exterior sheathing and interior face of the exterior façade shall be closed off with one of the following materials at the sill, jambs and header: 1 - Minimum 25-ga. thick steel flashing 2 - Minimum 2-inch thick, minimum 4-pcf mineral wool insulation, compressed into the gap between the exterior sheathing and exterior façade. When mineral wool is used steel flashing is not required.

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.