PATRIOT 200 HFO

CLOSED CELL SPRAY FOAM • LOW-GWP • UES ER-1046

PATRIOT 200 HFO is a two-component, medium-density, one-to-one by volume spray polyurethane foam (SPF) system. PATRIOT 200 HFO system consists of an "A" component (ISO) and a blended "B" component (Resin) in separate drums. PATRIOT 200 HFO contains low-GWP 1233zd blowing agent technology. PATRIOT 200 HFO is a medium-density foam in compliance with ICC 1100 and ICC AC 377.

PHYSICAL PROPERTIES

Core Density	ASTM D1622	2.0 pcf ± 0.10	**Fungi Resistance**	ASTM C1338	Pass, No Growth
R-Value @ 1"	ASTM C518	7.5	**Tensile Strength**	ASTM D1623	32 psi
R-Value @ 2"	ASTM C518	15	**Air Permeance @ 1"**	ASTM E2178 @ 75 PA	0.002 L/sm²
R-Value @ 3.5"	ASTM C518	26	**Dimensional Stability**	ASTM D2126	-4% @ 158°F
R-Value @ 4"	ASTM C518	29	**Compressive Strength**	ASTM E1621	25 psi
Water Vapor Permeance	ASTM E96	< 1 perm @ 1"	**Re-entry / Re-occupancy**	ASTM D8445	2 hours
Water Absorption	ASTM D2842	0.6% by volume	**Shelf Life**	–	6 months at 50°F–90°F
Closed Cell Content	ASTM D6226	97.5%	**IAPMO UES**	–	ER-1046

LIQUID PROPERTIES

PROPERTY	A SIDE: PMDI	B SIDE: PATRIOT 200 HFO
Color	ISOCYANATE Brown	RESIN Amber
Viscosity (Brookfield cps) @ 77°F	200 ± 30	600 ± 50
Specific Gravity	1.24	1.18
Mixing Ratio (volume)	1:1	1:1

FIRE TEST RESULTS

Flammability: Class A (Class 1)	ASTM E84 @ 4"	<25 Flame Spread; <450 Smoke Development
Large Scale Fire: Ignition Barrier	NFPA 286 Appendix X	PASS: NO COATING
Large Scale Fire: Thermal Barrier	NFPA 286*	PASS: 18 Wet Mils DC 315

PATRIOT 200 HFO meets or exceeds the IBC requirements for exterior walls in type I, II, III, IV and V construction. This includes NFPA 285 and NFPA 286, ASTM E1336 testing.

PROCESSING PARAMETERS

PRESSURE (DYNAMIC)
1000-1500 psi, depending on mix chamber

MACHINE TEMPERATURE
A Side: 110°F-130°F (43°C-54°C)
B Side: 110°F-130°F (43°C-54°C)

SUBSTRATE TEMPERATURE
Regular: 50°F-122°F (10°C-50°C)
Winter: 14°F-77°F (-10°C-25°C)

DRUM TEMPERATURE
A Side: 68°F-77°F (20°C-25°C)
B Side: 68°F-77°F (20°C-25°C)

HOSE HEAT TEMPERATURE
110°F-130°F (43°C-54°C)

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PROCESSING INSTRUCTIONS

AGITATION
DO NOT AGITATE.

DRUM TEMPERATURES & RECIRCULATION
DO NOT RECIRCULATE. STARTING CHEMICAL TEMPERATURES IN THE DRUMS SHOULD BE BETWEEN 50°F–75°F FOR BOTH THE A SIDE & B SIDE DRUMS. USE IR THERMOMETER OR INLET TEMPERATURE GAUGE TO MEASURE DRUM TEMPERATURE (A SIDE DRUM SHOULD NEVER BE WARMER THAN B SIDE DRUM). IF DRUM IS BELOW 50°F, THEN SLOWLY RAISE TEMPERATURE WITH WARMING BLANKET OR HEATED STORAGE. NEVER SUPER-HEAT WITH PORTABLE HEATER. IF DRUM IS TOO HOT THEN BLOWING AGENT WILL BOIL OFF.

SUBSTRATE CONDITION
SUBSTRATE MUST BE CLEAN, DRY, AND MOISTURE CONTENT <19%. SUBSTRATE TEMPERATURE SHOULD BE >5°F ABOVE DEW POINT. WHEN SUBSTRATE TEMPERATURE IS BELOW 45°F, PRE-HEATING THE BUILDING MAY BE NECESSARY. WHEN HEATING CONCRETE OR METAL SUBSTRATE WITH PORTABLE HEATERS, ONLY HEAT TO 50°F, OTHERWISE CONDENSATION MAY FORM. NEVER USE PORTABLE PROPANE HEATERS. WHEN SUBSTRATE TEMPERATURES VARY, PLEASE REFER TO SUBSTRATE TEMPERATURE UNDER PROCESSING PARAMETERS SECTION FOR PROPER SELECTION OF FOAM GRADE.

CONTAMINATION
B SIDE IS SENSITIVE TO CONTAMINATION FROM OTHER PRODUCTS. NEVER COMBINE THIS PRODUCT WITH ANY OTHER PRODUCT AND NEVER COMBINE OPEN CELL WITH CLOSED CELL PRODUCTS. TRANSFER PUMPS MUST BE PROPERLY CLEANED BETWEEN PRODUCT.

SPRAY TECHNIQUE
SPRAY UP AND DOWN APPROXIMATELY 18” FROM SURFACE. THE FARTHER AWAY YOU SPRAY, THE COLDER THE CHEMICAL WILL BE WHEN REACHING SUBSTRATE. LAYERING WILL REDUCE YIELD, BUT MAKE SPRAY SMOOTHER. WHEN SUBSTRATE TEMPERATURE IS BELOW 35°F, MAY NEED ½” PRIMING LAYER TO IMPROVE ADHESION.

METAL / CONCRETE APPLICATIONS
WHEN APPLYING ON METAL OR CONCRETE YOU MAY NEED A ½” PRIMING LAYER. INCREASE TEMPERATURES BY 2°F–5°F TO ACCOUNT FOR HEAT LOSS FROM THESE SURFACES.

MAX PASS THICKNESS
MAX PASS THICKNESS IS 3”. IF THE FOAM IS APPLIED TOO HOT OR TOO THICK, FOAM WILL OVERHEAT AND MAY HAVE A BURNT OR “FISHY” ODOR, CAUSE FUTURE SHRINKAGE, OR POSSIBLY LEAD TO FIRE HAZARD (INCLUDING SPONTANEOUS COMBUSTION). SECOND LAYER MAY BE APPLIED AFTER FIRST LAYER IS HARD TO THE TOUCH. IMPORTANT: CORE FOAM TEMPERATURE SHOULD NEVER EXCEED 270°F.

TEMPERATURE SETTINGS
AS A GENERAL RULE OF THUMB, THE HOSE TEMPERATURE IS THE MOST IMPORTANT SETTING AND SHOULD BE SET FIRST. THE A SIDE IS SET 2°F–5°F HIGHER THAN THE HOSE. THE B SIDE IS SET 2°F–5°F HIGHER THAN THE A SIDE.

HIGH ALTITUDE
AT HIGHER ELEVATIONS, A SIDE & B SIDE TEMPERATURES MAY HAVE TO BE SET THE SAME AS THE HOSE. FOAM EXPANDS BETTER AT HIGHER ELEVATION. BE CAREFUL TO CONTROL PASS THICKNESS.

HEATED HOSE
A POORLY INSULATED HOSE MAY NOT BE ABLE TO MAINTAIN ADEQUATE HOSE HEAT AND DRASTICALLY CHANGE REQUIRED TEMPERATURE SETTINGS ON PRIMARY HEATERS. NEVER INCREASE HOSE TEMPERATURE ABOVE 145°F – YOU CAN BURN THE HOSE.

MAXIMIZING YIELD / DIALING-IN TEMPS
DOZENS OF FACTORS AFFECT YIELD, BUT PROPERLY DIALING IN TEMPERATURES AND NUMBER OF LAYERS IS CRITICAL. IDEAL CORE TEMPERATURE SHOULD BE 240°F–260°F; THIS IS THE YIELD SWEET SPOT (USE A DIGITAL MEAT THERMOMETER TO TEST THE CORE TEMPERATURE). DO NOT EXCEED 270°F. FOR EXPERIENCED SPRAYERS, START TEMPERATURES COLD ENOUGH THAT THE RISING FOAM SAGS SLIGHTLY, THEN INCREASE TEMPERATURES 5°F AT A TIME UNTIL SAGGING STOPS. MANY THIN LAYERS WILL REDUCE YIELD SIGNIFICANTLY.

PRESSURE SETTINGS
MIX PRESSURE SETTINGS TO THE GUN FOR 01 MIX CHAMBER SHOULD BE @1000 PSI, FOR 02 @1200 PSI. HIGHER FLUID PRESSURE SETTINGS CREATE MORE MIST AND REQUIRE GREATER DISTANCE FROM THE CAVITY, RESULTING IN MORE OVERSPRAY. HIGHER PRESSURE WILL GENERALLY LOWER YIELD. SET AIR PURGE PRESSURE TO 80–100 PSI.

CAUTIONS & RECOMMENDATIONS

PATRIOT 200 HFO IS DESIGNED FOR INSTALLATION IN MOST STANDARD CONSTRUCTION CONFIGURATIONS USING COMMON MATERIALS SUCH AS CONCRETE, METAL, AND WOOD PRODUCTS. IT IS ALSO APPROVED FOR UNDER-SLAB USE IN CONCRETE FLOORS WITH IN-FLOOR HEATING. THE FOAM SHOULD NOT BE USED WHEN THE CONTINUOUS SERVICE TEMPERATURE OF THE SUBSTRATE IS >180°F. FOAM PLASTIC INSTALLED IN WALLS OR CEILINGS MAY PRESENT A FIRE HAZARD UNLESS PROTECTED BY AN APPROVED, FIRE-RESISTANT THERMAL BARRIER WITH A FINISH RATING OF NOT LESS THAN 15 MINUTES AS REQUIRED BY BUILDING CODES. RIM JOISTS/HEADER AREAS IN ACCORDANCE WITH THE IRC® AND IBC® MAY NOT REQUIRE ADDITIONAL PROTECTION. FOAM PLASTICS MUST ALSO BE PROTECTED AGAINST IGNITION BY CODE-APPROVED MATERIALS IN ATTICS AND CRAWL SPACES, OR AS CODE APPROVED ALTERNATIVES APPLY. AS WITH ALL SPF SYSTEMS, IMPROPER APPLICATION TECHNIQUES SHOULD BE AVOIDED AND ANY DEFECTIVE PRODUCT SHOULD BE REPLACED WITH PROPERLY INSTALLED MATERIALS. EXAMPLES OF IMPROPER APPLICATION TECHNIQUES INCLUDE, BUT ARE NOT LIMITED TO: EXCESSIVE APPLICATION THICKNESS, OFF-RATIO MATERIAL, AND SPRAYING INTO OR UNDER RISING LIQUID FOAM. ADDITIONALLY, OFF-RATIO MATERIALS CAN RESULT IN OFFENSIVE ODORS THAT MAY NOT DISSIPATE. IT IS THE RESPONSIBILITY OF THE APPLICATOR TO UNDERSTAND HOW THEIR EQUIPMENT WORKS

JOBSITE WARNINGS

APPLICATORS SHOULD ENSURE THE SAFETY OF THE JOBSITE AND CONSTRUCTION PERSONNEL. SPF INSULATION IS COMBUSTIBLE AND APPROPRIATE SIGNS SHALL BE POSTED WARNING THAT ALL “HOT WORK” SUCH AS WELDING, SOLDERING, AND CUTTING WITH TORCHES SHOULD NOT TAKE PLACE UNTIL A THERMAL BARRIER OR APPROVED EQUIVALENT IS INSTALLED OVER ANY EXPOSED POLYURETHANE FOAM. CONTRACTORS SHOULD COMMUNICATE WITH OTHER TRADES WORKING IN PROXIMITY TO THE SPRAY APPLICATION AREA. APPROPRIATE WARNING SIGNS MUST BE POSTED AT EACH ENTRYWAY, CLEARLY INDICATING THAT SPRAY FOAM ACTIVITY IS IN PROGRESS AND THAT PROPER RESPIRATORY PROTECTION IS REQUIRED FOR ENTRY. PROPER VENTILATION DURING SPRAYING AND AFTERWARDS AT MINIMUM 10 AIR CHANGES PER HOUR. RE-ENTRY: VENTILATE FOR 2 HOURS BEFORE PERSONAL PROTECTIVE EQUIPMENT IS NO LONGER REQUIRED FOR TRADES AND INSPECTORS. RE-OCCUPANCY: AFTER 2 HOURS OF CONTINUOUS VENTILATION, BUILDING MAY BE REOCCUPIED.

TROUBLESHOOTING GUIDE

DELAMINATION
IF FOAM DELAMINATES FROM SUBSTRATE, IT MAY BE FROM COLD SUBSTRATE. APPLY AN INITIAL ½” PRIMING LAYER TO IMPROVE ADHESION. ANOTHER CAUSE MAY BE EXCESS MOISTURE IN SUBSTRATE; TRY REDUCING A SIDE TEMPERATURES BY 5°F–7°F TO REDUCE ISO REACTIVITY. SPRAYING OVER UNCURED FOAM MAY ALSO CAUSE DELAMINATION.

BLISTERING
IF THERE ARE VOIDS AND BLISTERS BEHIND FOAM, IT MAY BE FROM TOO MUCH MOISTURE IN SUBSTRATE. APPLY A FLASH LAYER PASS TO THE SUBSTRATE, THEN APPLY REGULAR PASS AS NORMAL. IF SPRAYING ON METAL AND BLISTERS FORM, TRY INCREASING THICKNESS OF INITIAL PASS (NO LESS THAN ½”).

ELONGATED CELL STRUCTURE
IF THE FOAM HAS STRETCHED OR ELONGATED CELLS, THEN IT IS LIKELY TOO HOT. TRY REDUCING ALL TEMPERATURES BY 5°F.

LARGE CELL STRUCTURE
IF THE FOAM CONSISTENTLY HAS A LARGE CELL STRUCTURE, THE B SIDE RESIN MAY BE CONTAMINATED WITH OPEN CELL RESIN, OR THE MIX CHAMBER MAY BE CONTAMINATED OR WORN OUT.

CRUNCHY OR GUMMY
IF FOAM IS CRUNCHY AND AMBER IN COLOR, THEN FOAM MAY BE ISO RICH AND OFF-RATIO. IF “GUMMY” CONSISTENCY, THEN FOAM MAY BE RESIN RICH. CHECK EQUIPMENT. CURED FOAM SHOULD BE SNAPPY IN CONSISTENCY WHEN BROKEN APART.

CHALKY / BRITTLE
IF FOAM IS CHALKY OR BRITTLE, THEN FOAM IS TOO HOT. LOWER ALL HEATERS BY 5°F–7°F. IF PROBLEM DOES NOT RESOLVE, LOWER TEMPERATURE BY ANOTHER 5°F AND REPEAT.

CURING TOO FAST
IF THE CLOSED CELL IS CURING TOO FAST, THEN IT IS TOO HOT AND COULD RESULT IN FUTURE CRACKING. LOWER TEMPERATURES BY 3°F OR AS NEEDED.

CURING TOO SLOW
IF THE CLOSED CELL IS CURING TOO SLOW, THEN IT IS TOO COLD AND YOU MAY SEE A NARROW SPRAY PATTERN. RAISE TEMPERATURES BY 5°F–7°F OR AS NEEDED.

GUN IS CLOGGING OFTEN
IF THE MIXING CHAMBER NEEDS CONSTANT CLEANING, THEN FOAM MAY BE TOO HOT. LOWER TEMPERATURES BY 3°F–5°F OR AS NEEDED. ALSO CHECK GUN AIR SETTINGS.

POOR YIELD
IF FOAM YIELD IS POOR: CHECK FOR PROPER BARREL/SUBSTRATE TEMPERATURES, ACCURATE PROCESSING TEMPERATURES AND CORRECT MIXING CHAMBER SIZING. IF TEMPERATURES ARE DIALED-IN TOO COLD, THEN LACK OF HEAT WILL GENERATE POOR CHEMICAL REACTIVITY AND POOR YIELD (SEE DRUM TEMPERATURES & MAXIMIZING YIELD UNDER PROCESSING INSTRUCTIONS). CHECK CHEMICAL EXPIRATION.

PULLS AWAY FROM STUDS
IF FOAM PULLS AWAY OR “SHRINKS” FROM STUDS OVER TIME, THEN IT WAS APPLIED TOO HOT, TOO THICK, OR SECOND LAYER WAS APPLIED OVER HOT FOAM.

FROTHING
MINIMUM DRUM TEMPERATURE OF 50°F IS NECESSARY TO BRING VISCOSITIES OF A SIDE & B SIDE IN ALIGNMENT TO PREVENT OFF-RATIO FOAM AND INCREASE YIELD; SETTING CHEMICAL TEMPERATURES ABOVE RECOMMENDATIONS MAY RESULT IN B SIDE FROTHING. IF THE B SIDE DRUM IS OVER 85°F, THEN THE BLOWING AGENT MAY BOIL AND CAUSE A PRESSURE IMBALANCE IN THE PROPORTIONER.

IMPORTANT
PATRIOT 200 HFO CONTAINS A DISSOLVED BLOWING AGENT. IF THE B SIDE DRUM IS OVERHEATED OR EXCESSIVELY AGITATED, THE CHEMICAL MAY FROTH OUT. USING WINTER FORMULA IN SUMMER TEMPERATURES MAY ALSO CONTRIBUTE TO FROTHING OR A PRESSURE IMBALANCE IN THE PROPORTIONER.

HEALTH & SAFETY INFORMATION

BEFORE WORKING WITH THIS PRODUCT, YOU MUST READ AND BECOME FAMILIAR WITH AVAILABLE INFORMATION, INCLUDING THE SAFETY DATA SHEET (SDS), REGARDING THE RISKS, PROPER USE AND SAFE HANDLING. ALL CONTRACTORS AND APPLICATORS MUST USE APPROPRIATE RESPIRATORY, SKIN AND EYE PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN HANDLING AND PROCESSING SPRAY FOAM SYSTEMS. REFER TO THE CENTER FOR THE POLYURETHANES INDUSTRIES (CPI): GUIDANCE FOR DEVELOPING A WRITTEN RESPIRATORY PROTECTION PROGRAM, GUIDANCE ON BEST PRACTICES FOR THE INSTALLATION OF SPRAY POLYURETHANE FOAM, AND SPRAY FOAM PRODUCT STEWARDSHIP GUIDANCE, AVAILABLE AT WWW.SPRAYPOLYURETHANE.ORG AND WWW.PATRIOTFOAM.COM.

SHELF LIFE & STORAGE

PATRIOT 200 HFO HAS A SHELF LIFE OF APPROXIMATELY SIX MONTHS FROM THE DATE OF MANUFACTURE WHEN STORED IN ORIGINAL, UNOPENED CONTAINERS AT 50°F-90°F. THIS MATERIAL SHOULD BE STORED IN A SECURE LOCATION AND NEVER IN DIRECT SUNLIGHT. STORAGE TEMPERATURES ABOVE THE RECOMMENDED RANGE WILL SHORTEN SHELF LIFE.

VAPOR RETARDER

WHEN INSTALLED AT A MINIMUM OF 1-INCH, PATRIOT 200 HFO IS CONSIDERED A CLASS II VAPOR RETARDER. CONSULT WITH LOCAL CODE OFFICIALS FOR SPECIFIC REQUIREMENTS. CLIMATE ZONE TABLES ARE AVAILABLE IN CURRENT IBC® AND IRC® PUBLICATIONS

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