

UL Solutions Evaluation Report

UL ER5817-03

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Sub-level 2: 07 20 00 - Thermal Protection
Sub-level 3: 07 21 00 - Thermal Insulation

COMPANY:

BASF CORP STYRENIC FOAMS DIV
1609 BIDDLE AVE
WYANDOTTE, MI 48192
<http://www.NEOPOR®.basf.us>

1. SUBJECT:

NEOPOR® GPS polystyrene resin enhanced with graphite and available in two grades – Standard and Plus

NEOPOR® GPS Standard Grades: F2200, F2200 BMB, F2300, F2300 BMB, F2400, F2400 BMB, F5 Pro, F5 Pro BMB, KF2200, KF2300, KF2300S, and KF2400

NEOPOR® GPS Plus Grades: F5200 Plus, F5200 Plus BMB, F5300, F5300 Plus, and F5300 Plus BMB

UL Solutions
333 Pfingsten Road
Northbrook, IL 60062
USA

T +1.847.272.8800

UL.com/Solutions

2. SCOPE OF EVALUATION

- 2021, 2018, 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2021, 2018, 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2021, 2018, 2015, and 2012 *International Energy Conservation Code*® (IECC)
- ICC ES Acceptance Criteria for Quality Documentation (AC10)
- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)

The products were evaluated for the following properties:

- Physical Properties (ASTM C578)
- Surface Burning Characteristics (UL 723)

Throughout this report, unless specifically indicated otherwise, the reference to NEOPOR® GPS will apply to all polystyrene resin grades described above.

3. REFERENCED DOCUMENTS

- ICC-ES Acceptance Criteria for Quality Documentation (AC10)
- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12)
- ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- UL 723, Test for Surface Burning Characteristics of Building Materials

4. USES

The expandable polystyrene resins designated as NEOPOR® GPS are used by independent manufacturers to produce expanded polystyrene (EPS) insulation boards. The resin beads are enhanced with graphite.

5. PRODUCT DESCRIPTION

5.1 General:

EPS insulation boards manufactured with expandable polystyrene resins are produced through the introduction of heat, without other additives. The process expands the resins, which are then molded into insulation boards at the densities and thicknesses specified in this report. Finished boards manufactured from these resins at the densities and thicknesses indicated in Table 1 have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with UL 723, as required by Section 2603.3 of the IBC or Section R316.3 of the IRC, as applicable, provided the finished boards are listed and labeled by an approved agency.

NEOPOR® GPS expandable polystyrene resins have been evaluated in accordance with Section 4.5.15.1.1 of the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12). The resins can be used to produce EPS insulation boards that comply with the ASTM C578 properties described in Table 2, Table 3a, and Table 3b, provided the finished EPS insulation boards are listed and labeled by an approved agency.

Table 1 – Insulation Board Density and Thickness for UL 723

RESIN GRADE	DENSITY (lb/ft ³)	MAXIMUM THICKNESS (In.)	Flame Spread *	Smoke Developed *
F2200, F2200 BMB, F2300, F2300 BMB, F2400, F2400 BMB, F5200 Plus, F5200 Plus BMB, F5300, and F5300 Plus, F5300 Plus BMB, KF2200, KF2300, KF2300S, KF2400	1.00 - 2.00	6	5	25
F5 Pro, F5 Pro BMB	1.00 - 3.00	6	25	40

*Flame spread and smoke developed recorded while material remained in the original test position. Ignition of molten residue on the furnace floor resulted in flame travel equivalent to calculated flame spread index of 175 and smoke developed index of over 500.

Table 2 – ASTM C578 Physical Property Requirements⁽¹⁾

RESIN GRADE	Type XI	Type I	Type VIII	Type II	Type II – High Density ⁽²⁾	Type IX	Type XIV	Type XV
F2200, F2200 BMB, F2300, F2300 BMB, F2400, F2400 BMB, KF2200, KF2300S, KF 2300, KF2400		X	X	X	X	X		
F5 Pro, F5 Pro BMB, F5300, F5300 BMB		X	X	X	X	X	X	X
F5200 Plus, F5200 Plus BMB, F5300 Plus, F5300 Plus BMB	X	X	X	X	X	X	X	X
Compressive Resistance, min, psi	5.0	10.0	13.0	15.0	20.0	25.0	40.0	60.0
Flexural Strength, min, psi	10.0	25.0	30.0	35.0	40.0	50.0	60.0	75.0
Water Vapor Permeance ⁽³⁾	5.0	5.0	3.5	3.5	3.5	2.5	2.5	2.5
Water Absorption by total immersion, max, volume %	4.0	4.0	3.0	3.0	3.0	2.0	2.0	2.0
Dimensional Stability (change in dimensions), max, %	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Oxygen Index, min, volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Density, min, lb/ft ³	0.70	0.90	1.15	1.35	1.45	1.80	2.40	3.00

⁽¹⁾ Refer to the Standard, ASTM C578 for further information on the requirements for Rigid, Cellular Polystyrene Thermal Insulation

⁽²⁾ This Type II is not in ASTM C578 but is marketed as a higher density material of the ASTM C578 Type II by the manufacturer.

⁽³⁾ Water Vapor Permeance values are based on 1-inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values may be calculated based on insulation thickness, by dividing the perm value shown by the installed thickness in inches.

Table 3a – Minimum Density and R-Value

RESIN GRADES: F5 Pro¹, F5 Pro BMB¹, F2200, F2200 BMB, F2300, F2300 BMB, F2400, F2400 BMB, F5300 Plus, F5300 Plus BMB, F5200 Plus, F5200 Plus BMB, KF2200, KF2300, KF2300S, and KF2400

ASTM C578 EPS TYPE	MINIMUM DENSITY (pcf)	R-VALUE (F•ft ² •h/Btu) Mean temperature: 75° (minimum) *	R-VALUE (F•ft ² •h/Btu) Mean temperature: 40° (minimum) *
I	0.90	4.5	4.7
VIII	1.15	4.5	4.8
II	1.35	4.5	4.9
II – High Density	1.45	4.6	4.9
IX	1.80	4.6	4.9
XIV ¹	2.40	4.5	-
XV ¹	3.00	4.4	-

*Thermal resistance (R-values) are based on tested values at 1.00 inch thickness at 75°F average temperature and must be multiplied by the installed thickness.

¹Denotes F5 Pro and F5 Pro BMB for Types XIV and XV only

Table 3b – Minimum Density and R-Value

RESIN GRADES: F5300 Plus, F5300 Plus BMB, F5200 Plus, F5200 Plus BMB

ASTM C578 EPS TYPE	MINIMUM DENSITY (pcf)	R-VALUE (F•ft ² •h/Btu) Mean temperature: 75° (minimum)*	R-VALUE (F•ft ² •h/Btu) Mean temperature: 75° (minimum)**
XI	0.70	4.9	4.6
I	0.90	5.0	4.7
VIII	1.15	5.0	4.7
II	1.35	5.0	4.7
II – High Density	1.45	5.0	4.7
IX	1.80	5.0	4.7

*Thermal resistance (R-value) is based on tested values at 1.06-inch thickness at 75°F average temperature and must be multiplied by the installed thickness.

**Thermal resistance (R-value) is based on tested values at 1.00-inch thickness at 75°F average temperature and must be multiplied by the installed thickness.

6. INSTALLATION

6.1 General:

Installation of finished EPS insulation boards manufactured from NEOPOR® GPS expandable polystyrene resins must be installed in accordance with the EPS manufacturer's installation instructions, this Evaluation Report and in accordance with Section 2603 of the IBC, Section R316 of the 2021, 2018, 2015, 2012 and 2009 IRC, and/or Section R314 of the 2006 IRC, as applicable.

6.2 Vapor Retarder

Finished EPS insulation boards manufactured from NEOPOR® GPS expandable polystyrene resins may be used as vapor retarders based on water vapor permeance (perm) values described in Table 2 when required in accordance with the applicable sections of the IBC, IRC, and IECC. Vapor retarders are certified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 Class III: 1.0 <perm ≤ 10 perm

6.3 Attics and Crawl Spaces:

Finished EPS insulation boards produced from NEOPOR® GPS resins used on walls of attics and crawl spaces as discussed in this Evaluation Report require the approved thermal barriers specified in Section 2603.4.1.6 of the IBC, or Section R316.5.3 of the 2021, 2018, 2015, 2012 and 2009 IRC, or Section R314.5.3 of the 2006 IRC, as applicable.

7. CONDITIONS OF USE

7.1 General:

The NEOPOR® GPS expandable polystyrene resins described in this report comply with or are suitable alternatives to what is specified in those codes listed in Section 2 of this report, subject to the following conditions:

- 7.2 The density and thickness of the insulation boards must be as noted in Sections 5 and 6 of this report.
- 7.3 Finished EPS insulation boards manufactured from the resins must be listed and labeled by an approved agency.
- 7.4 As noted in Section 6.3 of this report, finished insulation boards manufactured from the resins must be separated from the building interior by a thermal barrier complying with Section 2603.4 of the IBC, Section R316.4 of the 2021, 2018, 2015, 2012 and 2009 IRC, and/or Section R314.4 of the 2006 IRC, as applicable.
- 7.5 See UL Solutions Product iQ® for products evaluated for surface burning characteristics and physical properties in accordance with UL 723 and ASTM C578, Foamed Plastic – Component, [BRYX2](#).
- 7.6 The resins are manufactured by BASF, located at the manufacturing locations named below, under the UL LLC Recognition and Follow-Up Service Program, which includes inspections in accordance with quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC 10.

Company	Location	Plant ID (if applicable)
BASF SE	Ludwigshafen, Germany	UL SE
BASF CO LTD	Ulsan, South Korea	BASF BK F2000

8. SUPPORTING EVIDENCE

- 8.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12).
- 8.2 Data in accordance with UL 723, ASTM C578, and ASTM C518
- 8.3 UL Solutions Component Recognition for EPS unexpanded resins, See Product Recognition Category, Foamed Plastic – Component ([BRYX2](#)).
- 8.4 Documentation of quality system elements described in AC10.

9. IDENTIFICATION

The BASF NEOPOR® GPS expandable polystyrene resins described in this evaluation report are identified by a marking bearing the report holder's name (BASF Corp), the plant identification, the UL Component Recognition Mark, and the evaluation report number UL ER5817-03. The validity of the evaluation report is contingent upon this identification appearing on the product.

10. USE OF UL SOLUTIONS EVALUATION REPORT

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UL Solutions Headquarters
333 Pfingsten Road
Northbrook, IL 60062-2096 USA
T: 847.272.8800
UL.com/Solutions