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Technical Bulletin

NFPA 285 Wall Assemblies

BASF Neopor® NFPA 285 Compliance

Neopor® GPS — the next Generation of insulation

BASF Neopor® GPS is a graphite polystyrene (GPS) rigid foam insulation that gives maximum efficiency, cost-effectiveness and sustainability on construction projects. Planners, architects, contractors and builder-owners benefit from insulation made of Neopor GPS because of the special advantages this material offers. Silver-Grey Neopor GPS is comprised of many small pockets of air within a polymer matrix containing graphite. The graphite reflects radiant heat energy like a mirror, increasing the material's resistance to the flow of heat, or R-value. Most polymer-based foams exhibit a greater ability to slow the movement of heat as the temperature decreases. Neopor GPS is in a unique class because it increases in R-value as the temperature outside drops**.**

Neopor GPS is S.M.A.R.T. insulation:

Stability and Durability

Neopor GPS is adaptable in size, thickness, shape and density, providing maximum flexibility and durability.

And, Neopor GPS is stable as it consistently delivers the highest true R-value performance over time.

Moisture-management

Neopor GPS is a breathable and semi-permeable high performance insulation that helps reduce the risk of mold, rot and structural damage associated with moisture condensation and long-term water retention.

Adaptable to all climate zones

Neopor GPS powers up when it gets cold outside. Insulating external walls with Neopor GPS increases the temperature of their inside surfaces which helps create a better indoor climate. And, Neopor GPS boards are thinner than others so the same effect is achieved with less material.

Resource-efficient

Neopor GPS uses up to 30% less material than other rigid foam insulation to achieve the same R-value, saving on building materials and installation labor.

Third-party validated and certified

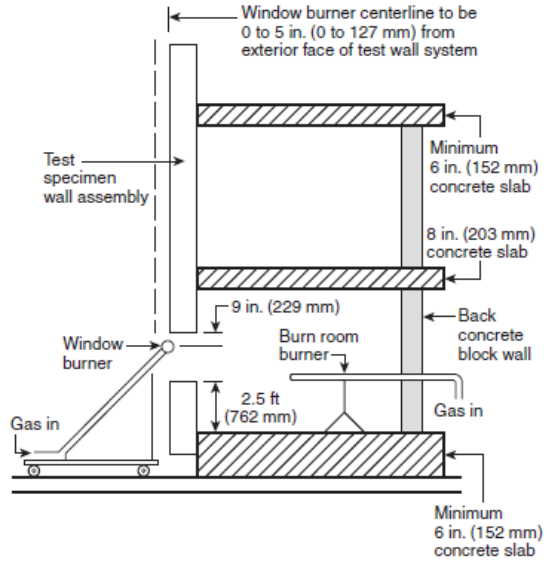
Neopor GPS earned GREENGUARD Gold Certification and has been referenced by both The Collaborative for High Performance Schools (CHPS) and the Leadership in Energy and Environmental Design (LEED®) Building Rating System.

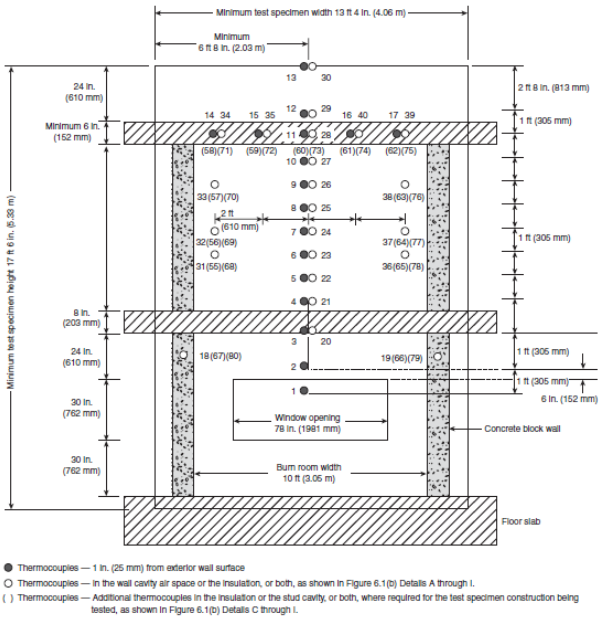
NFPA 285 Compliance

BASF has passed several NFPA 285 tests resulting in third party approval for a wide range of product thicknesses, densities, and other wall component choices. The systems are approved for Neopor® GPS over steel stud or concrete base walls with an array of exterior claddings including brick, concrete, CMU, stone veneer, terra cotta and stucco.
See UL Listing EWS0025 and EWS0026 for specific details. **THE NFPA 285 Fire Test**

The NFPA 285 fire test is designed to test the flame spread properties of exterior walls containing combustible components. Two noncombustible rooms are stacked to simulate two stories of a multi-story building. The wall assembly is then attached to the exterior face of the rooms. A typical test wall measures 14 ft x 18 ft with a 30 in. x 78 in. window opening placed on the bottom floor. Two burners are ignited to produce a specific time-temperature profile in the room and on the exterior face of the wall. Thermocouples are placed at strategic locations to monitor temperature as an indicator of flame spread. During a test, a calibrated fire starts in the bottom room. After 5 minutes, the exterior burner is ignited to produce a specific heat flux/temperature pattern on the exterior of the wall. Both burners remain ignited during the 30 minute test. Laboratory personnel monitor flame spread visually during the course of the test. A computer data acquisition system monitors and records the thermocouples temperatures. The criteria for passing are as follows (reworded in simple terms for this brochure):

1) Flames shall not spread vertically 10 ft above the window opening as determined visually or by thermocouples located at the 10 ft level. Failure occurs when thermocouples 11 or 14-17 exceed 1000°F.
2) Flames shall not spread (visually) horizontally 5 ft on either side of the centerline of the window opening.
3) Flames shall not spread inside the wall cavity as determined by thermocouples placed within the wall cavity insulation and air-gaps if present. Failure occurs when thermocouples 28 or 31-40, or 55-65 and 68-79 exceed 750°F above ambient.
4) Flames shall not spread horizontally within the wall cavity past the interior room dimension as determined by wall cavity thermocouples. Failure occurs when thermocouples 18-19, 66-67 or 79-80 exceed 750°F above ambient.
5) Flames shall not spread to the second story room as determined by interior wall surface thermocouples. Failure occurs when thermocouples 49-54 exceed 500°F above ambient.
6) Flames shall not occur in the second story (visually).
7) Flames shall not escape (visually) from the interior to the exterior at the wall/wall intersection of the bottom story room.





● Thermocouples — 1 in. (25 mm) from exterior wall surface
○ Thermocouples — in the wall cavity air space or the insulation, or both, as shown in Figure 6.1(b) Details A through I.
( ) Thermocouples — Additional thermocouples in the insulation or the stud cavity, or both, where required for the test specimen construction being tested, as shown in Figure 6.1(b) Details C through I.

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Neopor® GPS (Graphite Polystyrene) rigid insulation is today's energy-efficient and cost-effective insulation solution for architects, builders and contractors. The table shows data of Neopor® GPS F5300 Plus at 1 - 1/16"

Property	Unit	Neopor® GPS Plus[3)]				
ASTM C578 Classification[1)]		Type I	Type VIII	Type II	Type II+	Type IX
Compressive Resistance	at yield of 10% deformation in psi (min)	10.0	14.0	15.0	20.0	25.0
Thermal Resistance (R-value)[2)]	°F·ft2·h/BTU (°C·m2/W) at 75°F	5.0	5.0	5.0	5.0	5.0
	°F·ft2·h/BTU (°C·m2/W) at 40°F	5.2	5.2	5.2	5.3	5.3
Water Vapor Permeance	Max perm (ng/Pa·s·m2)	4.0	3.1	3.1	3.1	2.5
Water Absorption by Total Immersion	Max volume % absorbed	1.1	1.1	1.1	1.1	1.1
Flexural Strength	psi (min)	25.0	32.0	39.0	40.0	50.0
Density	lbs./ ft^3 (min)	0.90	1.15	1.35	1.45	1.80
Flame Spread	Index	5				
Smoke Development	Index	25				

1) Neopor® GPS meets and exceeds ASTM C578-13, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation"; published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.
2) R means resistance to heat flow. The higher the R-value, the greater the insulating power. Ask your seller for the fact sheet on R-values.
3) The technical and physical metrics provided in this table are reference values for insulation products made of Neopor GPS. The values and properties may vary depending on how they are processed and produced. The R-value properties are based on 1-1/16 in thickness. c

Table 1 – NFPA 285 WIDE APPROVAL ASSEMBLIES

Drawing Item #	Specific Component Listing
Base Wall (item 1)	1) Cast Concrete Walls 2) CMU Concrete Walls 3) 20 GA. (min.), 3⅝" (min.) steel stud spaced 24 in. OC (max.) with lateral bracing every 4 ft. vertically
Interior stud sheathing (item 3)	⅝" type X Gypsum Wallboard
Exterior stud sheathing (item 4) Note: Item 2 (None) may only be used when stud cavity insulation is item 2 (Thermafiber)	1) ½" (min.) Glass Matt Gypsum Sheathing 2) None (see note).
Fire Stopping at floorlines (item 9)	4 in. thick, 4 pcf mineral fiber insulation installed in full depth in stud cavity and friction fit.
Stud Cavity Insulation (item 2) Note: Use option 1 or 3 only if exterior sheathing option 1 is used.	1) None. 2) Mineral Fiber Insulation (Full stud depth required only when no exterior sheathing is used) 3) Any faced or unfaced fiberglass matt or non-combustible insulation 4) BASF Spray Foam Spraytite 178 (up to full cavity depth) 5) BASF Spray Foam Walltite HP+, Walltite, US, Walltite US-N, or Spraytite 81206 (1 inch max air gap)
Weather Resistive Barrier Applied to Exterior Sheathing. Use 1 or 2	1) None 2) Any of the following: a. BASF Enershield HP or Enershield I b. Tremco EXOAir 130 or EXOAir 230 c. Grace Perm-A-Barrier VPS, AWM, VPL, NPS, NPL, NPL_10 or VPL, LT d. CCW Barritech NP, VP, VP LT, FireResist 705VP or FireResisit 705FR-A e. Prosoco R-Guard Cat-5, R-Guard VB, R-Guard MVP)NLA), R-Guard Spray Wrap (NLA), or R-Guard Sparywrap MVP. Note: NLA = No Longer Available, but may be used if needed. f. Henry VP160, Air Bloc 21 FR, Air Block 33MR, or Air Bloc 31MR g. STO Emerald Coat h. Dow Corning DefendAir 200 Low Temp (now known only as DefendAir 200) i. Hohmann & Barnard Enviro-Barrier VP or Enviro-Barrier
Exterior Insulation Use 1,2,3,or 4	1) BASF Neopor® (1 pcf) max. thickness 10" 2) BASF Neopor® (1.25 pcf) max. thickness 8.75" 3) BASF Neopor® (1.5 pcf) max thickness 7.5" 4) BASF Neopor® (2.0 pcf) max thickness 5"
Weather Resistive Barrier Applied to Exterior Insulation Use 1 or 2	1) None 2) Any of the following a. Tyvek Commercialwrap (1 layer)

Exterior Cladding (item 10) Note. Cladding items 1-3 may use maximum 2" air gap between cladding and exterior insulation	1) Brick – Nominal 3⅝" clay brick with. Brick Ties/Anchors spaced 24" OC (max.) horizontal, 16 in. OC (max.) vertical 2) Concrete – minimum 2" thick 3) CMU – minimum 2" thick 4) Natural Stone Veneer – minimum 2" thick installed using any standard non-open joint installation technique. 5) Terra Cotta Cladding – minimum 1¼" thick installed using any standard non-open joint installation technique such as shiplap. 6) Stucco – minimum ¾" thick exterior cement plaster and lath.
Window Header Use 1 or 2 Note. 25 GA. Sheet steel caps the mineral fiber or wood	1) 25 GA. (min.) sheet steel with 1"(min.) mineral fiber insulation 2) 25 GA. (min.) sheet steel with 2 layers (min.) of ¾ inch plywood or 1 ½" solid lumber
Jambs **Use 1 or 2** **Note. 25 GA. Sheet steel caps the mineral fiber**	25 GA. (min.) sheet steel with 1" mineral fiber insuataion

Note: Weather Resistive Barrier Analysis described in Priest & Associates Letter 10218H

ASTM C578 EPS TYPE	MINIMUM DENSITY (pcf)	*R-VALUE* (F•ft²•h/Btu) Mean temperature: 75° (minimum) *
I	0.90	5.0
VIII	1.15	5.0
II	1.35	5.0
II – High Density	1.45	5.0
IX	1.80	5.0

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

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Technical Note: A question has arisen at a jobsite on whether the use of joint tape on Neopor foam is required or not required. The purpose of this engineering letter is to answer this question.
In the proposed construction, it our understanding that the wall system is a brick wall insulated with Neopor foam insulation. Synershield or Enershield weather barrier is being used behind the Neopor foam.
The weather barrier under the foam provides sufficient air and water barrier characteristics for proper wall construction. It is not necessary to seal the insulation panel joints with a tape product if a weather barrier is installed over the exterior sheathing (under the foam). If fact, sealing the joints may result in a situation in which moisture is trapped between the weather barrier and the foam. This can cause negative consequences such as mold or other problems.
Proper wall design should use a weather barrier placed in strategic locations to prevent moisture from entering the building, but installed in such a way as to prevent moisture from being trapped in wall assemblies.

For commercial walls, The Building Sciences Corporation shows the following as a good wall design: (ref. http://buildingscience.com/documents/insights/bsi-001-the-perfect-wall).

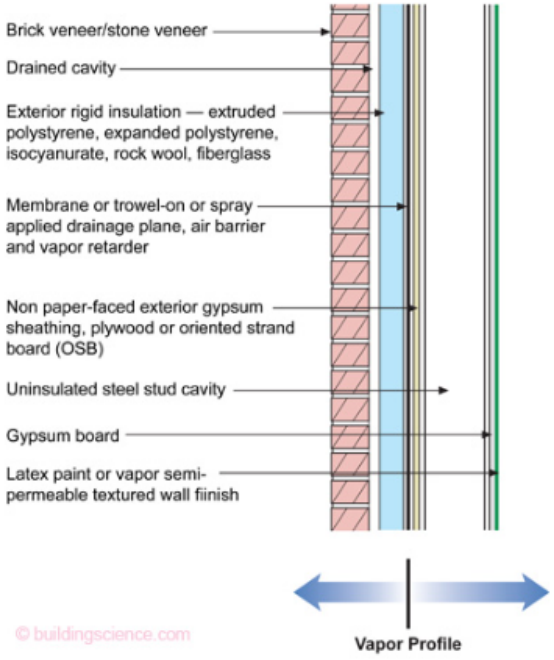

Figure 8: "The Commercial Wall"—The almost best wall we know how to construct. Affordable. Works everywhere in all climate zones.

Notice that the WRB is placed behind the insulation. Moisture from the outside stays outside, and moisture from the inside can flow back inside. If a second WRB layer is placed over the insulation, this will create a situation in which moisture can be trapped. Assuming a WRB is installed on the exterior sheathing, if tape is placed over the joints of Neopor insulation, this will create a double WRB effect trapping moisture. This should be avoided.
Conclusion: When a WRB is placed underneath Neopor, Tape should not be used to seal insulation joints.

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BASF Enershield | Neopor GPS Plus Rigid Insulation Board | Non-Combustible Cladding

Table 2: This is a summary of various wall assemblies that meet the requirements of NFPA 285.

Wall Components	Materials
Base Wall System *– Use either 1, 2 or 3*	1. Concrete wall 2. Concrete masonry wall 3. 1 layer - 5/8-inch interior gypsum board over: 3-5/8-inch deep, 20 GA galvanized steel studs, 24-inch O.C.
Floorline Fire Stopping	4 lb/cu ft. mineral wool (e.g. Thermafiber) in each stud cavity at each floorline
Cavity Insulation *– Use either 1, 2 or 3*	1. None 2. Any non-combustible insulation (faced or unfaced) 3. Fiberglass Batt (faced or unfaced)
Exterior Sheathing *– Use either 1, 2 or 3*	1. None (if concrete wall or masonry wall) 2. 1/2-inch thick exterior gypsum sheathing (for Base Wall System 3 above) 3. 5/8-inch thick Type X exterior gypsum sheathing (for Base Wall System 3 above)
Water-Resistive/Air Barrier Applied to Exterior Sheathing, Concrete or Masonry *- Use either 1 or 2*	1. ENERSHIELD-HP 2. ENERSHIELD-I
Exterior Continuous Insulation *– Use either 1, 2 or 3*	1. BASF Neopor® GPS Plus Rigid Insulation Board – ASTM C578, Type II (1.45 pcf), maximum 4-inch thickness 2. Extruded polystyrene (XPS) foam plastic insulation – ASTM C578, Type IV, maximum 3-inch thickness 3. Expanded polystyrene (EPS) foam plastic insulation – ASTM C578, Type II, maximum 4-inch thickness
Sheathing Joints / Flashing	4-inch wide SHEATHING FABRIC installed over all horizontal and vertical joints, embedded in a painted stripe of ENERSHIELD-HP or ENERSHIELD-I
Exterior Wall Covering *– Use either 1, 2, 3, 4, or 5*	1. Brick – Standard type brick veneer anchors, installed a maximum 24-inches on center, vertically on each stud with maximum 2-inch air gap between exterior insulation and brick. Brick to be standard nominal 4-inch thick clay brick installed in a running bond pattern using Type S mortar 2. Stucco – Minimum ¾-inch thick, exterior cement plaster and lath 3. Minimum 2-inch thick natural stone (granite, limestone, marble, sandstone). Any standard non- open jointed installation technique can be used 4. Minimum 1-½ inch thick concrete masonry unit (CMU), pre-cast concrete, or artificial cast stone. Any standard non-open jointed installation technique can be used 5. Minimum 1-¼ inch thick Terra Cotta non-open jointed. Any standard non-open jointed installation technique can be used
Flashing of window, door and other exterior wall penetrations	ENERSHIELD-HP or ENERSHIELD-I with SHEATHING FABRIC; TF MEMBRANE (with FLASHING PRIMER) coated with ENERSHIELD-HP or ENERSHIELD-I; maximum 12-inch wide flashing tape (acrylic, asphalt or butyl-based)

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Neopor Rigid Insulation board is produced in North America by insulation manufacturers who convert Neopor raw material supplied by BASF to rigid insulation board under BASF Quality Guidelines. The board carries the Neopor trademark but marketed under product names designed by the block molder. Reference to Neopor as an 'ingredient brand' is evidence that Neopor is inside the finished insulation board powering its insulation performance.

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