



Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

Report No: 1403-02



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BASF HP+™ Wall X Series

Trade Secret Report Holder:

BASF Corporation

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 12 00 - Structural Panels

Section: 06 12 19 - Shear Wall Panels

Section: 06 16 00 - Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 - Thermal Insulation

Section: 07 25 00 - Water-Resistive Barriers/Weather Barriers

1 Innovative Product Evaluated¹

- 1.1 BASF HP+ Wall X Series utilizing WALLTITE® Max™ Spray Polyurethane Foam (SPF) in combination with NEOPOR® Graphite Polystyrene Foam Plastic Insulating Sheathing (FPIS) Laminated to 7/16" Oriented Strand Board (OSB) with BASF-Approved Adhesive

2 Product Description and Materials

- 2.1 BASF HP+ Wall X Series is a proprietary wall system consisting of BASF WALLTITE Max SPF combined with NEOPOR FPIS and 7/16" OSB.
 - 2.1.1 BASF HP+ Wall X Series contains a combination of the following materials:
 - 2.1.1.1 1 1/2" WALLTITE Max SPF
 - 2.1.1.2 9/16" or 11/16" NEOPOR FPIS laminated to 7/16" OSB

2.2 The innovative product evaluated in this report is shown in **Figure 1** and **Figure 2**.

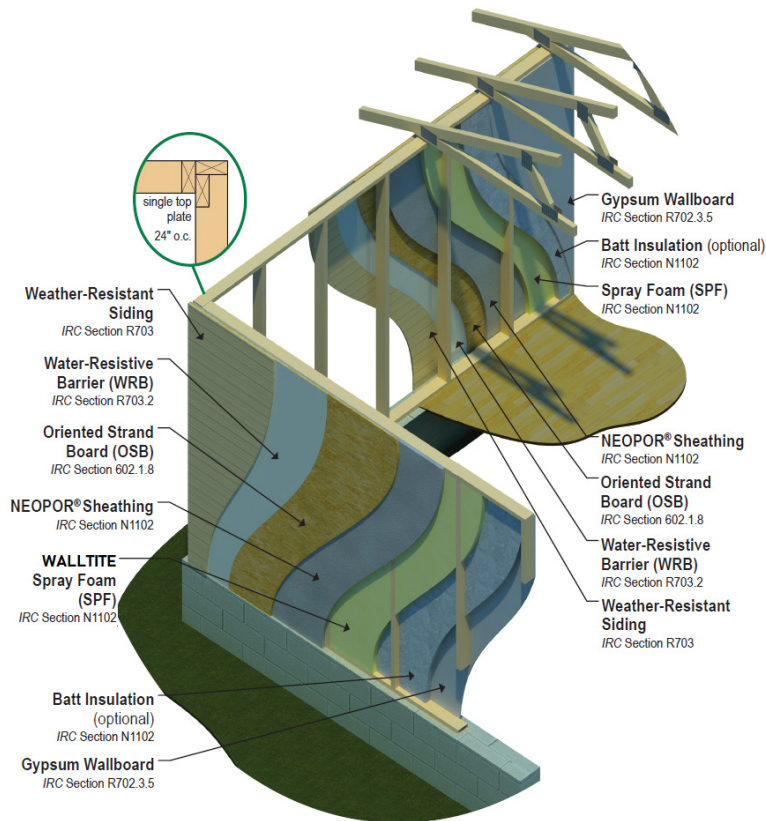


Figure 1. Illustration of BASF HP+ Wall X Series System

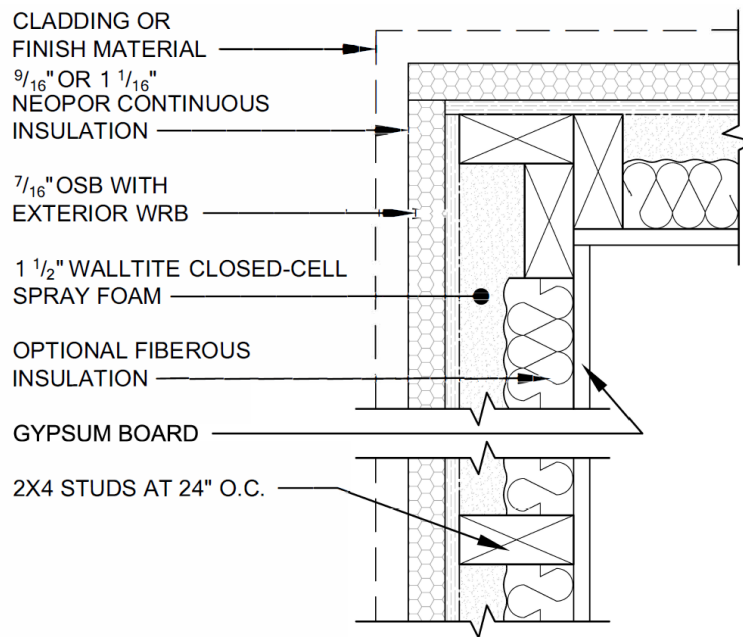


Figure 2. Cross Section of WALLTITE HP+ Wall X Series

2.3 As needed, review material properties for design in **Section 6** and the regulatory evaluation in **Section 8**.



3 Definitions

- 3.1 New Materials² are defined as building materials, equipment, appliances, systems, or methods of construction, not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.³ The design strengths and permissible stresses shall be established by tests⁴ and/or engineering analysis.⁵
- 3.2 Duly authenticated reports⁶ and research reports⁷ are test reports and related engineering evaluations, which are written by an approved agency⁸ and/or an approved source.⁹
 - 3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).¹⁰
- 3.3 An approved agency is “*approved*” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is accredited and listed in the ANAB directory.
- 3.4 An approved source is “*approved*” when a professional engineer (i.e., Registered Design Professional or RDP) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.¹¹
- 3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.
 - 3.5.1 The Center for Building Innovation (CBI) is ANAB¹² ISO/IEC 17025 and ISO/IEC 17020 accredited.
- 3.6 The regulatory authority shall enforce¹³ the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing¹⁴ stating the nonconformance and the path to its cure.
- 3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.¹⁵
- 3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory. Therefore, recognition of certificates and validation statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope shall be approved.¹⁶ Thus, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.¹⁷
- 3.9 Approval equity is a fundamental commercial and legal principle.¹⁸

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation¹⁹

4.1 Standards

- 4.1.1 *AATCC TM127: Water Resistance: Hydrostatic Pressure Test*
- 4.1.2 *ACC: Guidance on Best Practices for the Installation of Spray Polyurethane Foam*
- 4.1.3 *ACC: Ventilation Considerations for Spray Polyurethane Foam*
- 4.1.4 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*
- 4.1.5 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- 4.1.6 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 4.1.7 *ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*
- 4.1.8 *ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics*
- 4.1.9 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*
- 4.1.10 *ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*
- 4.1.11 *ASTM D2842: Standard Test Method for Water Absorption of Rigid Cellular Plastics*



- 4.1.12 *ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics*
- 4.1.13 *ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*
- 4.1.14 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*
- 4.1.15 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*
- 4.1.16 *ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*
- 4.1.17 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference*
- 4.1.18 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 4.1.19 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*
- 4.1.20 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 4.1.21 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*
- 4.1.22 *NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*
- 4.1.23 *SBCA: Guide for Handling, Installing, and Temporary Bracing of Wall Panels*
- 4.2 Structural performance or shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F have been tested and evaluated in accordance with the following standards:
 - 4.2.1 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
 - 4.2.2 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*
 - 4.2.2.1 ASTM D7989 is accepted engineering practice used to establish Seismic Design Coefficients (SDC).
 - 4.2.2.2 Tested data generated by ISO/IEC 17025 approved agencies and/or professional engineers, which use ASTM D7989 as their basis, are defined as intellectual property and/or trade secrets.
 - 4.2.2.3 All professional engineering evaluations are defined as an independent design review (i.e., Listings, certified reports, duly authenticated reports from approved agencies, and/or research reports, are prepared independently by approved agencies and/or approved sources, when signed and sealed by licensed professional engineer pursuant to registration law.
 - 4.2.3 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*
 - 4.2.4 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 4.3 *Regulations*
 - 4.3.1 *IBC – 15, 18, 21: International Building Code®*
 - 4.3.2 *IRC – 15, 18, 21: International Residential Code®*
 - 4.3.3 *IECC – 15, 18, 21: International Energy Conservation Code®*
 - 4.3.4 *IFC – 14, 17: International Fire Code®*



5 Listed²⁰

- 5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), an approved agency (i.e., CBI and DrJ), and/or an approved source (i.e., DrJ), or other organization(s) concerned with product evaluation (i.e., DrJ), that maintains periodic inspection (i.e., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

- 6.1 BASF HP+ Wall X Series is used in buildings constructed in accordance with the IBC requirements for Type V light-frame construction.
- 6.2 BASF HP+ Wall X Series is used in buildings constructed in accordance with the IRC for light-frame wood construction.
- 6.3 BASF HP+ Wall X Series is used to provide the following:
- 6.3.1 Lateral load resistance (wind and seismic) for braced BASF HP+ Wall X Series panels used in light-frame wood construction.
 - 6.3.2 Transverse load resistance (wind pressure) for braced BASF HP+ Wall X Series panels used in light-frame wood construction.
 - 6.3.3 Thermal resistance in the exterior wall component of the building thermal envelope.
 - 6.3.4 Resistance to uplift and gravity loads in single top plate applications for BASF HP+ Wall X Series assemblies used in light-frame wood construction.

6.4 Structural Applications

- 6.4.1 Except as otherwise described in this report, the BASF HP+ Wall X Series shall be installed in accordance with the applicable building codes listed in **Section 4**, using the provisions set forth therein for the design and installation of Wood Structural Panels (WSP).
- 6.4.1.1 BASF HP+ Wall X Series is permitted to be designed in accordance with SDPWS for the design of shear walls using the methods set forth therein, including the perforated shear wall methodology, and are subject to the SDPWS boundary conditions, except as specifically allowed in this report.
- 6.4.2 Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall:
- 6.4.2.1 For wind design, anchor bolt spacing shall not exceed 6' o.c. (1829 mm)
 - 6.4.2.2 For seismic design, anchor bolt spacing shall not exceed 4' o.c. (1219 mm)
- 6.4.3 The maximum aspect ratio for full height BASF HP+ Wall X Series braced wall segments shall be 4:1.
- 6.4.4 The minimum full height panel width shall be 24" (610 mm).
- 6.4.5 All NEOPOR panel edges shall be supported with dimensional lumber or blocking a minimum 2" (51 mm) nominal in the least dimension.
- 6.4.6 *Prescriptive IRC Bracing Applications:*
- 6.4.6.1 For wind design, BASF HP+ Wall X Series may be used to brace walls of buildings as an alternative to the IRC Continuous Wall Bracing provisions, IRC Section R602.10.4 (CS-WSP), in accordance with the bracing amounts shown in **Table 1**, as adjusted in accordance with IRC Table R602.10.3(2).
 - 6.4.6.2 For seismic design, required braced wall panel lengths for BASF HP+ Wall X Series shall be as shown in **Table 2**, and shall be used in conjunction with IRC Table R602.10.3(4), which provides the required adjustments.



6.4.6.3 Where a building, or portion thereof, does not comply with one or more of the bracing requirements within the prescriptive section of the IRC, those portions shall be designed and constructed in accordance with IRC Section R301.1.

Table 1. IRC Bracing Requirements for BASF HP+ Wall X Series – Wind^{1,2,3,4}

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line with Continuous Sheathing ⁵									
		BASF HP+ Wall X Series ⁶					WSP Structural Sheathing ⁶				
		Ultimate Design Wind Speed, V_{ult} (mph)									
		≤ 110	≤ 115	≤ 120	≤ 130	< 140	≤ 110	≤ 115	≤ 120	≤ 130	< 140
One Story or the Top of Two or Three Stories	10	1.1	1.4	1.4	1.8	1.8	1.5	2.0	2.0	2.5	2.5
	20	2.1	2.5	2.5	2.8	3.5	3.0	3.5	3.5	4.0	5.0
	30	3.2	3.2	3.5	4.2	4.9	4.5	4.5	5.0	6.0	7.0
	40	3.9	4.2	4.6	5.3	6.3	5.5	6.0	6.5	7.5	9.0
	50	4.9	5.3	5.6	6.7	7.7	7.0	7.5	8.0	9.5	11.0
	60	5.6	6.3	6.7	7.7	9.1	8.0	9.0	9.5	11.0	13.0
First Story of Two Stories or Second Story of Three Stories	10	2.1	2.5	2.5	3.2	3.5	3.0	3.5	3.5	4.5	5.0
	20	3.9	4.6	4.9	5.6	6.3	5.5	6.5	7.0	8.0	9.0
	30	5.6	6.3	6.7	8.1	9.1	8.0	9.0	9.5	11.5	13.0
	40	7.4	8.1	8.8	10.5	11.9	10.5	11.5	12.5	15.0	17.0
	50	9.1	9.8	10.9	12.6	14.7	13.0	14.0	15.5	18.0	21.0
	60	10.9	11.9	13.0	15.1	17.5	15.5	17.0	18.5	21.5	25.0
First Story of Three Stories	10	3.2	3.5	3.9	4.6	5.3	4.5	5.0	5.5	6.5	7.5
	20	6.0	6.3	7.0	8.1	9.5	8.5	9.0	10.0	11.5	13.5
	30	8.4	9.1	10.2	11.9	13.7	12.0	13.0	14.5	17.0	19.5
	40	10.9	11.9	13.0	15.4	17.5	15.5	17.0	18.5	22.0	25.0
	50	13.3	14.7	16.1	18.6	21.7	19.0	21.0	23.0	26.5	31.0
	60	16.1	17.5	18.9	22.1	25.6	23.0	25.0	27.0	31.5	36.5

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

- Demonstrates equivalency to IRC Table R602.10.3(1). All adjustment factors from IRC Table R602.10.3(2) shall be applied.
- Minimum 1/2" gypsum wallboard shall be installed as part of the wall assembly and fastened with a minimum 5d cooler nails or 1 1/4" #6 type W or S screws spaced 16" o.c. at panel edges and 16" o.c. in the field of the panels. Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.3.
- Bracing lengths are the result of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the regulations and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.
- Wind speeds are V_{ult} in accordance with ASCE 7-22. To convert to equivalent V_{asd} wind speed in accordance with IBC Section 1609.3.1 use: $V_{asd} = V_{ult} / \sqrt{0.6}$.
- Linear interpolation is permitted.
- BASF HP+ Wall X Series and WSP structural sheathing installed on 2 x 4 or 2 x 6 studs spaced 24" o.c. and fastened with nails spaced 6" o.c. at panel edges and 12" o.c. in the field of the panels.



Table 2. IRC Bracing Requirements for BASF HP+ Wall X Series – Seismic^{1,2,3,4,5}

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line with Continuous Sheathing ⁶							
		BASF HP+ Wall X Series ⁷				WSP Structural Sheathing ⁷			
		Seismic Design Category (SDC)							
		C	D ₀	D ₁	D ₂	C	D ₀	D ₁	D ₂
One Story or the Top of Two or Three Stories	10	1.0	1.2	1.2	1.5	1.4	1.6	1.7	2.1
	20	1.9	2.1	2.4	3.0	2.7	3.1	3.4	4.3
	30	2.9	3.2	3.5	4.5	4.1	4.6	5.1	6.4
	40	3.8	4.3	4.8	5.9	5.4	6.1	6.8	8.5
	50	4.8	5.4	5.9	7.4	6.8	7.7	8.5	10.6
First Story of Two Stories or Second Story of Three Stories	10	1.8	2.2	2.6	3.3	2.6	3.2	3.8	4.7
	20	3.5	4.5	5.4	6.6	5.1	6.4	7.7	9.4
	30	5.4	6.7	8.1	9.8	7.7	9.6	11.5	14.0
	40	7.1	9.0	10.7	13.1	10.2	12.8	15.3	18.7
	50	9.0	11.2	13.4	16.4	12.8	16.0	19.1	23.4
First Story of Three Stories	10	2.6	3.1	3.5	NP	3.8	4.5	5.1	NP
	20	5.4	6.3	7.1	NP	7.7	9.0	10.2	NP
	30	8.1	9.4	10.7	NP	11.5	13.4	15.3	NP
	40	10.7	12.5	14.3	NP	15.3	17.9	20.4	NP
	50	13.4	15.6	17.9	NP	19.1	22.3	25.5	NP

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

- Demonstrates equivalency to [IRC Table R602.10.3\(3\)](#). All adjustment factors from [IRC Table R602.10.3\(4\)](#) shall be applied.
- Minimum 1/2" gypsum wallboard shall be installed as part of the wall assembly and fastened with a minimum 5d cooler nails or 1 1/4" #6 type W or S screws spaced 16" o.c. at panel edges and 16" o.c. in the field of the panels. Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.3
- Bracing lengths are the result of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.
- Tabulated bracing lengths are based on the following:
 - Soil class = D
 - Wall height = 10 ft
 - Floor dead load = 10 psf
 - Roof/ceiling dead load = 15 psf
 - Braced wall line spacing ≤ 25'
- NP = Not Provided
- Linear interpolation is permitted.
- BASF HP+ Wall X Series and WSP structural sheathing installed on 2 x 4 or 2 x 6 studs spaced 24" o.c. and fastened with nails spaced 6" o.c. at panel edges and 12" o.c. in the field of the panels.



6.4.7 *Alternative Prescriptive IRC Bracing Applications:*

6.4.7.1 As an alternative to **Section 6.4.6**, the following provisions are permitted:

6.4.7.1.1 BASF HP+ Wall X Series may be used to brace walls of buildings as an alternative to the Continuous Wall Bracing provisions of IRC Section R602.10.4, when installed in accordance with this report.

6.4.7.1.2 Required braced wall panel lengths for BASF HP+ Wall X Series shall be as determined by the equivalency factor shown in **Table 3**, and IRC Table R602.10.3(1) or IRC Table 602.10.3(3), including all adjustments required in IRC Table R602.10.3(2) or IRC Table 602.10.3(4), respectively.

6.4.7.1.2.1 Bracing lengths in these tables for Method CS-WSP shall be multiplied by the equivalency factor listed in **Table 3**.

Table 3. Braced Wall Line Length Equivalency Factor^{1,2,3}

Wall Assembly	Gypsum Sheathing ⁴	Maximum Stud Spacing ⁵ (in)	Fastener	Fastener Spacing (edge:field) (in)	Equivalency Factor to IRC CS-WSP
BASF HP+ Wall X Series	None	24 o.c.	0.131" x 3"	6:12	0.65
	1/2" GWB	24 o.c.	0.131" x 3"	6:12	0.70

SI: 1 in = 25.4 mm

- Multiply the bracing lengths in IRC Table R602.10.3(1) or IRC Table R602.10.3(3) Method WSP or CS-WSP as applicable, including all footnotes, by the factors shown here to establish the required bracing length.
- Valid for single and double top plate BASF HP+ Wall X Series installations.
- For factory-built applications only. Wall panels to be spray foamed in the horizontal position only.
- Gypsum sheathing installed with Type W screws at 16":16" spacing. Where gypsum wallboard is not applied to the interior side of the BASF HP+ Wall X Series assembly, bracing lengths shall be multiplied by a factor of 1.3.
- SPF framing.

6.4.7.1.2.2 These braced wall line length equivalency factors are based on equivalency testing and are used to comply with Method CS-WSP of the IRC.

6.4.7.1.2.3 The BASF HP+ Wall X Series tested equivalency factors listed in **Table 3**, allow the user to determine the length of bracing required by multiplying the factor from **Table 2** by the length shown in the CS column in IRC Table R602.10.3(1) or IRC Table 602.10.3(3), as modified by all applicable factors in IRC Table R602.10.3(2) or IRC Table R602.10.3(4), respectively.

6.4.7.1.3 All IRC prescriptive bracing minimums, spacing requirements, and rules must still be met.

6.4.8 *Prescriptive IBC Conventional Light-Frame Wood Construction:*

6.4.8.1 BASF HP+ Wall X Series may be used to brace exterior walls of buildings as an equivalent alternative to Method WSP of the IBC when installed continuously along the length of the braced wall line with 1/2" (12.7 mm) gypsum on the interior fastened with a minimum 5d cooler nail, or #6 type W or S screw spaced a maximum of 16" o.c. (203 mm) at panel edges and 16" o.c. in the field. Bracing shall be in accordance with the conventional light-frame construction method of IBC Section 2308.6.3 and this report.



6.4.9 Performance-Based Wood-Frame Construction:

- 6.4.9.1 BASF HP+ Wall X Series designed as shear walls are permitted to be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in **Table 4**, **Table 5**, **Table 6**, and **Table 7**.
- 6.4.9.2 BASF HP+ Wall X Series shear walls are permitted to resist horizontal wind load forces using the allowable shear loads (in pounds per linear foot) set forth in **Table 4**.

Table 4. Allowable Stress Design (ASD) Capacity for Wind

Structural Sheathing ¹	Fastener ²	Maximum Stud Spacing (in)	Fastener Spacing ³ (edge:field) (in)	Gypsum Wallboard (GWB)	GWB Fastener Spacing ⁴ (edge:field) (in)	Allowable Unit Shear Capacity (plf)
BASF HP+ Wall X Series	0.131" x 3" Nails	24 o.c.	6:12	None	N/A	475
				1/2"	16:16	515

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- Sheathing used in BASF HP+ Wall X Series shall have joints butted at framing members, and a single row of fasteners must be applied to each panel edge into the stud below.
- Minimum fastener size and spacing are as shown above with a minimum panel edge distance of 3/8".
- Fasteners may be spaced at 48:48, when applied in a factory setting with the panels spray foamed in the horizontal position.
- Gypsum attached with minimum #6 type W or S screws 1 1/4" long.

- 6.4.9.3 BASF HP+ Wall X Series shear walls that require seismic design in accordance with IBC Section 1613 shall use the seismic allowable unit shear capacities set forth in **Table 5**.

- 6.4.9.3.1 The response modification coefficient, R, system overstrength factor, Ω_0 , and deflection amplification factor, C_d , indicated in **Table 5**, shall be used to determine the base shear, element design forces, and design story drift in accordance with ASCE 7 Chapter 12 and Section 14.5.

Table 5. Seismic Allowable Unit Shear & Design Coefficients

Seismic Force Resisting System	Maximum Stud Spacing (in)	GWB	Seismic Allowable Unit Shear Capacity ² (plf)	Apparent Shear Stiffness, G_a (kips/in)	Response Modification Factor, ³ R	System Overstrength Factor, ⁴ Ω_0	Deflection Amplification Coefficient, ⁵ C_d	Structural System Limitations and Building Height Limit ⁶ (ft)				
								Seismic Design Category				
								B	C	D	E	F
BASF HP+ Wall X Series	24 o.c.	None	380	10	6.5	3	4	NL	NL	65	65	65
		1/2"	410	14	6.5	3	4	NL	NL	65	65	65

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- Gypsum attached with minimum #6 type W or S screws 1 1/4" long spaced 16" o.c. at panel edges and in the field. Maximum stud spacing is 24" o.c.
- OSB and NEOPOR fastened to studs using minimum 8d galvanized box nails spaced 6":12" (edge:field) with a minimum panel edge distance of 3/8".
- Response modification coefficient, R, for use throughout ASCE 7. Note: R reduces forces to a strength level, not an allowable stress level.
- The tabulated value of the overstrength factor, Ω_0 , is permitted to be reduced by subtracting 0.5 for structures with flexible diaphragms.
- Deflection amplification factor, C_d , for use with ASCE 7 Section 12.8.6, 12.8.7, and 12.9.1.2
- NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2.



6.5 Axial Loading

6.5.1 BASF HP+ Wall X Series has been tested for both uplift and compression on single top plate applications.

6.5.2 **Table 6** shows the maximum allowable uplift and compression forces allowed in this application.

6.5.2.1 Designs using the allowable loads in **Table 6** shall have a load path capable of transferring loads from their point of origin to their final point of resistance, in accordance with IRC Section R301.1.

6.5.2.2 Installation is permitted for single top plate (advanced framing method) or double top plate applications.

6.5.2.2.1 Where truss reactions are less than or equal to the values in **Table 6**, trusses can be set anywhere along the top plate as needed to frame the roof system.

Table 6. Allowable Roof Framing Reactions on BASF HP+ Wall X Series Top Plate^{1,2,3}

Wall Assembly	Fastener		Interior Sheathing Material	Maximum Roof Framing Reactions ⁴ (lb)	
	Type	Spacing (edge:field) (in)		Uplift	Compression
BASF HP+ Wall X Series	0.131" x 3" Nail	6:12	None	1,050	1,630

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

- Maximum allowable load assumes load is concentrated at the mid-span of the top plate between studs.
- BASF HP+ Wall X Series assemblies are a maximum 24" o.c. stud spacing utilizing a single top plate. All stud cavities are filled with 1.5" BASF SPF.
- All other framing connections are in accordance with the applicable building code.
- Applies to placement anywhere along the wall top plate.

6.5.2.2.2 Where a single top plate of No. 3, standard or stud grade dimensional lumber is used, studs below are spaced 24" o.c., and floor or roof framing members are spaced a maximum of 24" o.c., such members shall be located within 3" of the center of the studs below.

6.5.2.2.3 Where a single top plate of No. 2 SPF dimensional lumber or equivalent is used, studs below are spaced 24" o.c., and floor or roof framing members are spaced a maximum of 24" o.c., such members shall be located within 5" of the center of the studs below.

6.5.2.2.4 Uplift capacities are permitted to be increased through the use of mechanical connectors of the top plate to stud and sole plate to stud connections.

6.5.2.2.5 All other framing conditions shall be in accordance with the applicable code.

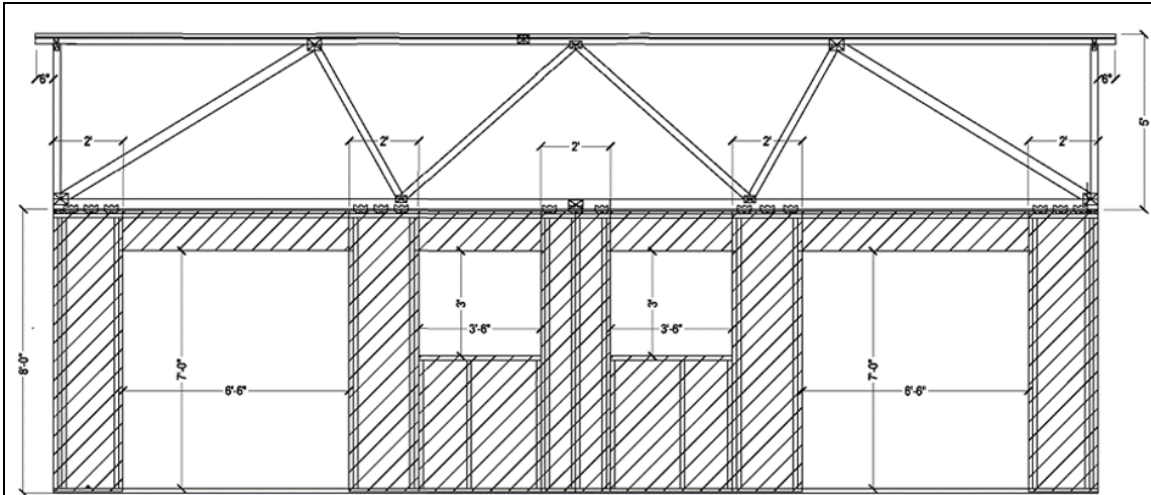
6.6 Perforated Shear Walls

6.6.1 BASF HP+ Wall X Series shear walls are permitted to be designed in accordance with the methodology found in SDPWS Section 4.3.3.5, with the following exceptions:

6.6.1.1 SDPWS Equation 4.3-5 for C_o shall be replaced with the equation from **Table 7**.

Table 7. C_o for Use with the SDPWS Perforated Shear Wall Methodology

Wall Assembly	Replace SDPWS Eq. 4.3-5 with the Following:
BASF HP+ Wall X Series	$C_o = \frac{r}{(1.1 - 0.1 * r)} \times \frac{L_{tot}}{\sum L_i}$



The total length of the perforated shear wall, L_{tot} , is 30'.
 The height of the perforated shear wall, h , is 8'.
 The sum of the perforated shear wall segment lengths, ΣL_i , is 10'.

The total area of the openings, A_o , is:

Two (2) 7' x 6' 6" openings – 45.5 sq. ft. x 2 = 91 sq. ft.
 Two (2) 3' x 3' 6" openings – 10.5 sq. ft. x 2 = 21 sq. ft.
 Total opening area is: 91 + 21 = 112 sq. ft.

Using SDPWS Equation 4.3-6, the sheathing area ratio, r , is:

$$r = \frac{1}{1 + \frac{A_o}{h \Sigma L_i}} = \frac{1}{1 + \frac{112}{8 * 10}} = 0.417$$

Using **Table 7**, the shear capacity adjustment factor, C_o , is:

$$C_o = \frac{r}{1.1 - 0.1 * r} \times \frac{L_{tot}}{\Sigma L_i} = \frac{0.417}{1.1 - 0.1 * 0.417} * \frac{30}{10} = 1.18$$

From **Table 4**, the allowable unit shear capacity, v , for the BASF HP+ Wall X Series system is 475 plf.

In accordance with SDPWS Section 4.3.3.5, the total ASD shear capacity of this perforated shear wall, $V_{perforated}$, is:

$$V_{perforated} = v * \Sigma L_i \times C_o = 475 \text{ plf} \times 10 \text{ ft} \times 1.18 = 5,605 \text{ lb}$$

Figure 3. Example of a Perforated Shear Wall

6.7 Transverse Wind Loading

- 6.7.1 BASF HP+ Wall X Series installed over exterior framing and spaced a maximum of 24" o.c. without an interior covering, can resist allowable wind loads (see **Table 8**) and wind speeds (see **Table 9**). Required components and cladding loads to be resisted are found in IBC Section 1609.1.1, IRC Table R301.2.1(1),²¹ and IRC Table R301.2.1(2).²²



Table 8. Transverse (Out-Of-Plane) Wind Load Resistance¹

Wall Assembly	Maximum Stud Spacing (in)	Fastener Schedule ²	Allowable Design Value (psf)
BASF HP+ Wall X Series	24 o.c.	0.131" x 3" nail, 48":48" o.c. to edge:field	24 o.c.

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m²

- Applies to both the positive and negative direction.
- The attachment of the sheathing to the framing is primarily through the adhesion of the SPF to the framing and NEOPOR. Average depth is 1 1/2".

Table 9. Basic Wind Speed for Use in Exterior Wall Covering Assemblies^{1,2}

Wall Assembly	Allowable Components and Cladding Basic Wind Speed ³ (mph)	
	ASCE 7-05 (V _{asd})	ASCE 7-16 and 7-22 (V _{ult})
BASF HP+ Wall X Series With 5/8" or 1 1/8" NEOPOR	155	200

SI: 1 mph = 1.61 km/h

- BASF HP+ Wall X Series fastened with 0.131" x 3" nail, 48":48" o.c. to edge:field.
- Allowable wind speeds are based on the following: Mean roof height 30', Exposure B, 10 sq. ft. effective wind area, corner zone 5.

6.8 Water-Resistive Barrier (WRB)

6.8.1 BASF HP+ Wall X Series shall be covered with a code-compliant WRB in accordance with IBC Section 1404.2²³ and IRC Section R703.2.

6.8.2 Flashing shall be installed at all sheathing penetrations and shall comply with the applicable code sections.

6.9 Thermal Resistance (R-Value)

6.9.1 BASF HP+ Wall X Series meets the continuous insulated sheathing requirements complying with the provisions of IRC Section N1102 and IECC Section C402.

6.9.2 BASF HP+ Wall X Series has the thermal resistance as shown in **Table 10**.

Table 10. Thermal Resistance Properties¹

Product	Thickness (in)	R-Value (°F•ft ² •hr/Btu)
9/16" NEOPOR with 7/16" OSB	1	3.2
1 1/16" NEOPOR with 7/16" OSB	1 1/2	5.3
BASF WALLTITE Max SPF	1 1/2	10.0

SI: 1 in = 25.4 mm

- Tested at a mean temperature of 75° F. Assumes a 0.5 R-value for OSB.



6.10 Air Barrier

6.10.1 BASF HP+ Wall X Series meets the requirements of [IECC Section C402](#) for use as a component of the air barrier when installed in accordance with the manufacturer installation instructions and this report (shown in **Table 11**).

Table 11. Air Barrier Properties^{1,2,3}

Product	Air Permeance [L/(s•m ²)]
BASF WALLTITE Max SPF	< 0.02
1. Tested in accordance with ASTM E2178. 2. Testing conducted on SPF material only. 3. Minimum 1½" thickness of SPF.	

6.11 Surface Burning Characteristics

6.11.1 BASF HP+ Wall X Series panels have the surface burning characteristics shown in **Table 12**.

Table 12. Surface Burning Characteristics¹

Product	Flame Spread Index	Smoke Developed Index	Classification
NEOPOR	< 25	< 450	Class A
BASF WALLTITE Max SPF			Class A
1. Tested in accordance with ASTM E84.			

6.12 Thermal Barrier Requirements – Attic, Crawlspace, or Other Uninhabitable Space Applications

6.12.1 Installation shall be fully protected from the interior of the building by an approved 15-minute thermal barrier or ignition barrier as required by [IBC Section 2603.4](#) and [IRC Section R316.4](#).

6.13 Where the application falls outside of the performance evaluation, conditions of use, and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

7 Certified Performance²⁴

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.²⁵

7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.²⁶



8 Regulatory Evaluation and Accepted Engineering Practice

- 8.1 BASF HP+ Wall X Series complies with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:
- 8.1.1 Structural performance under lateral load conditions for use as an alternative to the IRC Continuous Wall Bracing provisions of IRC Section R602.10.4 Method CS-WSP (Continuously Sheathed Wood Structural Panel).
 - 8.1.2 Structural performance under lateral load conditions for use as an alternative to the Conventional Wall Bracing provisions of IBC Section 2308.6.3, Method WSP (Wood Structural Panels).
 - 8.1.3 Structural performance for shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F, have been tested and evaluated in accordance with the standards listed in **Section 4**.
 - 8.1.4 Lateral force resisting systems for use in both wind and seismic applications follow the performance-based provisions of IBC Section 2306.1, IBC Section 2306.3, and/or SDPWS Section 4.3 for light-frame wood wall assemblies.
 - 8.1.5 **Table 5** provides SDC that conform to the requirements in ASCE 7 Section 12.2.1, 12.2.1.1, and Table 12.2-1 for design of wall assemblies in buildings that require seismic design.
 - 8.1.6 Structural performance under uplift and gravity loads for use with single top plates in accordance with IBC Section 1604 and IRC Section R301.1.
 - 8.1.7 Resistance to transverse loads for wall assemblies used in light-frame wood construction in accordance with IBC Section 1609.1.1 and IRC Section R301.2.1.
 - 8.1.8 Continuous insulated sheathing requirements for thermal resistance (R-value) complying with the provisions of IRC Section N1102 and IECC Section C402.
 - 8.1.9 Performance for use as a component of the air barrier in accordance with IRC Section N1102.4.1, IECC Section R402.4.1.1, and IECC Section C402.5.1.
 - 8.1.10 Surface burning characteristics complying with the provisions of IBC Section 2603.3 and IRC Section R316.3.
- 8.2 Performance of the BASF HP+ Wall X Series or any of its component materials for use as a WRB assembly or WRB material is outside the scope of this report.
- 8.3 Performance of the BASF HP+ Wall X Series or any of its component materials as used in the normal construction process is outside the scope of this report.
- 8.3.1 This includes storage, weather conditions, durability considerations, handling, installing, restraining, and bracing of the BASF HP+ Wall X Series system through the shipping, storing, and construction means and methods process.
 - 8.3.1.1 Use of BASF HP+ Wall X Series in a portal frame is outside the scope of this report.
- 8.4 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP/approved sources. DrJ is qualified²⁷ to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.
- 8.5 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which is also its areas of professional engineering competence.
- 8.6 Any regulation specific issues not addressed in this section are outside the scope of this report.

9 Installation

- 9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.
- 9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.
- 9.3 BASF HP+ Wall X Series shall be installed in a workman-like manner subject to industry-accepted tolerances.
- 9.4 A copy of the manufacturer published installation instructions shall be available at all times on the jobsite during installation.
- 9.4.1 Frame walls in accordance with the construction documents and the applicable building codes.
- 9.4.2 Wall panel/section shall be square and true prior to sheathing with NEOPOR/OSB.
- 9.4.3 The building designer is responsible for all temporary bracing.
- 9.5 Where required, GWB shall be a minimum 1/2" (12.7 mm) thickness.
- 9.6 Refer to the BASF HP+ Wall X Series Quality Assurance (QA) procedures and installation manual for construction means and methods support.
- 9.6.1 Storage, weather conditions, durability considerations, handling, installing, restraining, and bracing of the panels are defined in the QA procedures and installation process to support proper construction means and methods.
- 9.7 *NEOPOR/OSB Installation*
- 9.7.1 NEOPOR/OSB must be installed over studs having a nominal thickness of not less than 2" (51 mm) in the least dimension and spaced a maximum of 24" (610 mm) o.c. (see **Figure 4**).

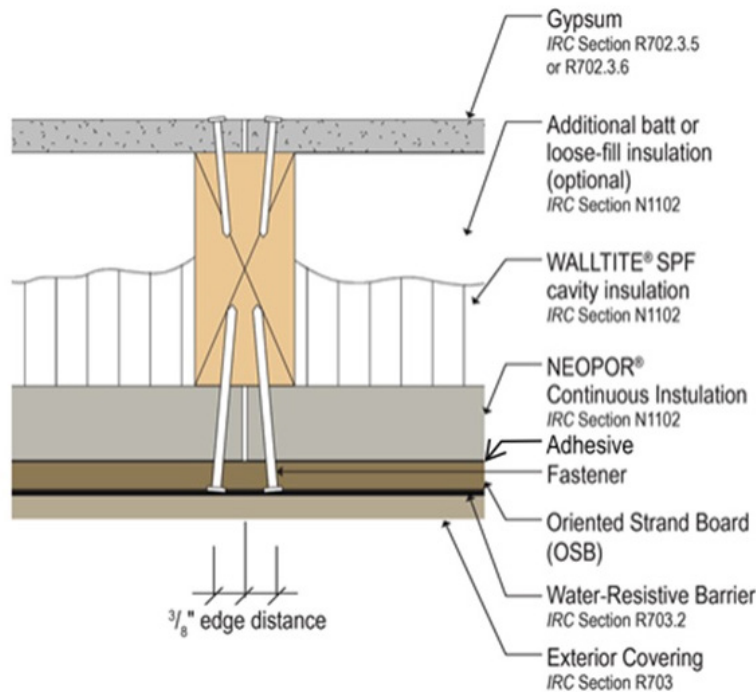


Figure 4. Fastening of NEOPOR/OSB and Gypsum Sheathing



- 9.7.2 NEOPOR/OSB must be installed vertically with the length dimension of the panels parallel to the framing behind and all panel edges supported by framing or blocking.
- 9.7.3 NEOPOR/OSB shall be installed with minimum 0.113" shank diameter nails with a minimum $\frac{3}{8}$ " diameter head.
- 9.7.4 Fasteners shall be of sufficient length to penetrate the framing a minimum of $\frac{3}{4}$ " and shall be installed with the head flush with the surface of the sheathing.
- 9.7.5 Fasteners shall be spaced a minimum of 6" o.c. (152 mm) at panel edges and 12" o.c. (305 mm) in the field.
- 9.7.6 Fasteners are intended to provide a temporary connection until the SPF is cured. Ensure tight connection between the NEOPOR/OSB and framing. Alternate methods of providing this restraint are acceptable.

9.8 *SPF Installation*

- 9.8.1 SPF shall be installed only by persons trained in accordance with the BASF Quality Assurance and Training Program (QATP).
- 9.8.2 SPF sets almost immediately. Ensure wall is square and true prior to SPF application.
- 9.8.3 Ensure NEOPOR/OSB is fastened tightly to the stud to prevent spray foam from entering and expanding between the stud and NEOPOR/OSB.
- 9.8.4 Take care to protect area and personnel from overspray.
- 9.8.5 Use a properly functioning high pressure proportioning spray equipment to process WALLTITE Max. All parts of the spray gun need to function as intended and be clean and free of debris.
- 9.8.6 Substrate shall be clear of debris and dry to the touch before applying WALLTITE Max.
- 9.8.7 Measure the temperature of the NEOPOR surface with an infrared gun. Substrate temperature shall be a minimum of 30° F and maximum of 105° F.
- 9.8.8 For proper processing of SPF components, refer to the WALLTITE Max Technical Product Data.
 - 9.8.8.1 Spray the initial pass of WALLTITE Max to the NEOPOR so that enough material is laid down to wet the surface without running or sagging.
 - 9.8.8.2 WALLTITE Max first pass should not exceed $\frac{1}{2}$ " thickness.
 - 9.8.8.3 Allow wetted surface to foam completely and cool before subsequent $1\frac{1}{2}$ " thick applications.
 - 9.8.8.4 Lapse time between passes will be dependent on the NEOPOR or foam substrate layer temperature.
- 9.8.9 Panels may be handled immediately after spraying. Full strength develops after 24 hours.
- 9.8.10 For enhanced automation processes, contact BASF Corporation.
- 9.8.11 Contractor must be BASF Quality Assurance Training Program certified.

9.9 *Gypsum Wallboard Installation*

- 9.9.1 Where required, gypsum wallboard shall be a minimum $\frac{1}{2}$ " (12.7 mm) thickness and shall be installed with a minimum of either of the following:
 - 9.9.1.1 #6 x $1\frac{1}{4}$ " (32 mm) type W or S screws
 - 9.9.1.2 5d cooler nails
- 9.9.2 For IBC and IRC prescriptive applications, gypsum fasteners shall be spaced a maximum of 16" (406 mm) o.c. at panel edges and 16" o.c. at intermediate framing. For engineered design, see **Table 3**.
- 9.9.3 Fastener edge distance is a minimum of $\frac{3}{8}$ " (10 mm).



10 Substantiating Data

- 10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
- 10.1.1 Lateral load testing in accordance with ASTM E2126
 - 10.1.2 Transverse wind load testing in accordance with ASTM E330
 - 10.1.3 Uplift load testing in accordance with ASTM E72
 - 10.1.4 Gravity load testing for single top plate applications in accordance with ASTM E72
 - 10.1.5 Strength testing for NEOPOR with BASF SPF in accordance with ASTM E72
 - 10.1.6 Strength testing for OSB with BASF SPF in accordance with ASTM E72
 - 10.1.7 Strength testing for OSB in accordance with ASTM E72
 - 10.1.8 Surface burning testing for NEOPOR in accordance with ASTM E84
 - 10.1.9 Material property testing for NEOPOR in accordance with ASTM C578
 - 10.1.10 Uniform static air testing for NEOPOR in accordance with ASTM E330
 - 10.1.11 Material property testing for BASF SPF in accordance with ASTM D1623, D1622, D2842, D2126, D6226, E2178, C518, and E96
 - 10.1.12 Water resistance properties of BASF SPF in accordance with AATCC TM 127
 - 10.1.13 Air leakage properties of BASF SPF in accordance with ASTM E283
 - 10.1.14 Thermal transmission properties of BASF SPF in accordance with ASTM C518
 - 10.1.15 Water penetration properties of BASF SPF in accordance with ASTM E331
 - 10.1.16 Surface burning testing of BASF SPF in accordance with ASTM E84
 - 10.1.17 Heat release and flame spread testing of BASF SPF in accordance with NFPA 286
- 10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or an RDP. Accuracy of external test data and resulting analysis is relied upon.
- 10.3 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.
- 10.5 *Testing and Engineering Analysis:*
- 10.5.1 The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.²⁸
- 10.6 Where additional condition of use and/or regulatory compliance information is required, please search for BASF HP+ Wall X Series on the DrJ Certification website.



11 Findings

- 11.1 As outlined in **Section 6**, BASF HP+ Wall X Series has performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.
- 11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, BASF HP+ Wall X Series shall be approved for the following applications:
- 11.2.1 Lateral load resistance due to wind and seismic loads carried by shear walls in accordance with **Table 1**, **Table 2**, **Table 3**, **Table 4**, **Table 5**, and **Table 7**.
 - 11.2.2 Resistance to axial and uplift loads in single top plate applications in accordance with **Table 6**.
 - 11.2.3 Transverse wind load resistance in accordance with **Table 8** and **Table 9**.
 - 11.2.4 Thermal resistance properties in accordance with **Table 10**.
 - 11.2.5 Air barrier properties in accordance with **Table 11**.
 - 11.2.6 Surface burning characteristics in accordance with **Table 12**.
- 11.3 Unless exempt by state statute, when BASF HP+ Wall X Series is to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.
- 11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from BASF Corporation.
- 11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10²⁹ are similar) in pertinent part state:
- 104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.
- 11.6 **Approved:**³⁰ Building regulations require that the building official shall accept duly authenticated reports.³¹
- 11.6.1 An approved agency is “*approved*” when it is ANAB ISO/IEC 17065 accredited.
 - 11.6.2 An approved source is “*approved*” when an RDP is properly licensed to transact engineering commerce.
 - 11.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.
- 11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.
- 11.8 Through the IAF Multilateral Arrangement (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.³²



12 Conditions of Use

- 12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.
- 12.2 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 12.3 As listed herein, BASF HP+ Wall X Series shall not be used:
 - 12.3.1 Without wall bracing, unless BASF HP+ Wall X Series is installed for use as wall bracing as described in this report.
- 12.4 When used in accordance with the IBC in Seismic Design Categories C, D, E or F, special inspections shall comply with IBC Section 1705.13.³³
- 12.5 When used in accordance with the IBC in high wind areas, special inspections shall comply with IBC Section 1705.12.³⁴
- 12.6 All panel edges shall be supported by wall framing or solid blocking a minimum of 2" (51 mm) nominal thickness in the least dimension.
- 12.7 The manufacturer installation instructions shall be available on the jobsite for inspection.
- 12.8 Refer to the BASF HP+ Wall X Series QA procedures and installation manual for construction means and methods support.
 - 12.8.1 Storage, weather conditions, durability considerations, handling, installing, restraining, and bracing of the panels are defined in the QA procedures and installation process to support proper construction means and methods.
 - 12.8.2 The contractor or wall installer is responsible for following the BASF HP+ Wall X Series QA procedures, installation instructions, and all means and methods of construction.
 - 12.8.3 Contact BASF Corporation for additional information regarding means and methods.
- 12.9 When required by adopted legislation and enforced by the building official, also known as the Authority Having Jurisdiction (AHJ) in which the project is to be constructed:
 - 12.9.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.
 - 12.9.2 This report and the installation instructions shall be submitted at the time of permit application.
 - 12.9.3 This innovative product has an internal quality control program and a third-party quality assurance program.
 - 12.9.4 At a minimum, this innovative product shall be installed per **Section 9** of this report.
 - 12.9.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.
 - 12.9.6 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4, and IRC Section R109.2.
 - 12.9.7 The application of this innovative product in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.
- 12.10 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *"the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11"*, all of IBC Section 104, and IBC Section 105.4.



- 12.11 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 12.12 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

- 13.1 The innovative product listed in **Section 1.1** is identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.
- 13.2 Additional technical information can be found at <https://spf.basf.com>.

14 Review Schedule

- 14.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.
- 14.2 For information on the status of this report, please contact [DrJ Certification](#).

15 Approved for Use Pursuant to United States and International Legislation Defined in Appendix A

- 15.1 BASF HP+ Wall X Series, when utilizing WALLTITE Max SPF in combination with NEOPOR Graphite Polystyrene FPIS Laminated to $7/16$ " OSB with BASF-Approved Adhesive is included in this report published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services. This report states either that the material, product, or service meets recognized standards or has been tested and found suitable for a specified purpose. This report meets the legislative intent and definition of being acceptable to the AHJ.



Appendix A

1 Legislation that Authorizes AHJ Approval

- 1.1 **Fair Competition:** State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies, and/or methods of construction that:
 - 1.1.1 Advance innovation.
 - 1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints.
 - 1.1.3 Benefit consumers through lower prices, better quality, and greater choice.
- 1.2 **Adopted Legislation:** The following local, state, and federal regulations affirmatively authorize products to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:
 - 1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies, and/or methods of construction. The goal is to “*protect economic freedom and opportunity by promoting free and fair competition in the marketplace*”.
 - 1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses, to freely and fairly have new products, materials, designs, services, assemblies, and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.
 - 1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),³⁵ where providing test reports, engineering analysis, and/or other related IP/TS is subject to prison of not more than ten years³⁶ and/or a \$5,000,000 fine or three (3) times the value of³⁷ the Intellectual Property (IP) and Trade Secrets (TS).
 - 1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of Listings, certified reports, Technical Evaluation Reports, duly authenticated reports, and/or research reports prepared by approved agencies and/or approved sources.
 - 1.2.4 For new materials³⁸ that are not specifically provided for in any regulation, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.
 - 1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.³⁹
 - 1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence provided in writing, that specific legislation have been violated by an individual registered PE.
 - 1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.⁴⁰



- 1.3 **Approved⁴¹ by Los Angeles:** The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction, not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards that apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.⁴² The Superintendent of Building Approved Testing Agency Roster is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a DrJ Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code, CBC Section 1707.1.⁴³
- 1.4 **Approved by Chicago:** The Municipal Code of Chicago (MCC) states in pertinent part that an approved agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly, and/or method of construction, not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined approved agencies).
- 1.5 **Approved by New York City:** The 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed⁴⁴ an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement⁴⁵ (i.e., ANAB, International Accreditation Forum also known as IAF, etc.).
- 1.6 **Approved by Florida:** Statewide approval of products, methods, or systems of construction, shall be approved without further evaluation by:
- 1.6.1 A certification mark or listing of an approved certification agency
 - 1.6.2 A test report from an approved testing laboratory
 - 1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity
 - 1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed, and sealed by a professional engineer or architect, licensed in Florida.
 - 1.6.5 For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods:
 - 1.6.5.1 A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code.
 - 1.6.5.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code.
 - 1.6.5.3 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity, which indicates that the product evaluated complies with the code.



- 1.6.5.4 A product evaluation report or certification based upon testing, comparative, or rational analysis, or a combination thereof, developed, signed, and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code.
- 1.6.5.5 A statewide product approval issued by the Florida Building Commission.
- 1.6.6 The [Florida Department of Business and Professional Regulation](#) (DBPR) website provides a listing of companies certified as a [Product Evaluation Agency](#) (i.e., EVLMiami 13692), a [Product Certification Agency](#) (i.e., CER10642), and as a [Florida Registered Engineer](#) (i.e., ANE13741).
- 1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA]):** A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation [553.842](#) and [553.8425](#).
- 1.8 **Approved by New Jersey:** Pursuant to the 2018 Building Code of New Jersey in [IBC Section 1707.1 General](#),⁴⁶ it states: *“In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from [approved agencies](#) in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)”*.⁴⁷ Furthermore N.J.A.C 5:23-3.7 states: *“Municipal approvals of alternative materials, equipment, or methods of construction”*.
 - 1.8.1 **Approvals:** Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official, provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability, and safety of those conforming with the requirements of the regulations.
 - 1.8.1.1 A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of the above.
 - 1.8.1.2 Reports of engineering findings issued by nationally recognized evaluation service programs such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of the above.
 - 1.8.2 The [New Jersey Department of Community Affairs](#) has confirmed that technical evaluation reports, from any accredited entity listed by [ANAB](#), meets the requirements of item the previous paragraph, given that the listed entities are no longer in existence and/or do not provide *“reports of engineering findings”*.
- 1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards:** Pursuant to Title 24, Subtitle B, Chapter XX, [Part 3282.14](#)⁴⁸ and [Part 3280](#),⁴⁹ the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:
 - 1.9.1 *“All construction methods shall be in conformance with accepted engineering practices.”*
 - 1.9.2 *“The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.”*
 - 1.9.3 *“The design stresses of all materials shall conform to accepted engineering practice.”*



- 1.10 **Approval by US, Local, and State Jurisdictions in General:** In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:
- 1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.⁵⁰
 - 1.10.2 For innovative alternatives and/or methods of construction, the building official shall accept duly authenticated reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.⁵¹
 - 1.10.2.1 An approved agency is “*approved*” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.
 - 1.10.2.2 An approved source is “*approved*” when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.⁵²
 - 1.10.3 The design strengths and permissible stresses of any structural material...shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.⁵³
- 1.11 **Approval by International Jurisdictions:** The USMCA and GATT agreements provide for approval of innovative materials, designs, services, and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:
- 1.11.1 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.
 - 1.11.2 **Approved:** The purpose of the MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA and subsequently, acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, designs, services, and/or methods of construction.
 - 1.11.3 ANAB is an IAF MLA signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.⁵⁴
 - 1.11.4 Therefore, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.⁵⁵
- 1.12 Approval equity is a fundamental commercial and legal principle.⁵⁶



Notes

1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702>

3 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review <https://www.justice.gov/atr/mission> and <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11>

4 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706>:-:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as

5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706>:-:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice

6 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>:-:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies

7 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>

8 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency

9 https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source

10 <https://www.law.cornell.edu/uscode/text/18/1832> (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of \$5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. To follow D TSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: [Intellectual Property and Trade Secrets](#)

11 <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>

12 <https://www.cbiteest.com/accreditation/>

13 <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104>:-:text=to%20enforce%20the%20provisions%20of%20this%20code

14 <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11>:-:text=Where%20the%20alternative%20material%2C%20design%20or%20method%20of%20construction%20is%20not%20approved%2C%20the%20building%20official%20shall%20respond%20in%20writing%2C%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND <https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1>:-:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%2C%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%2C%20stating%20the%20reasons%20therefore

15 <https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>:-:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11

16 <https://iaf.nu/en/about-iaf-mia/#>:-:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

17 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

18 <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>

19 Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service, and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

20 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2> (Listed%20or%20certified); <https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed> AND <https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled>

21 [2018 IRC Table R301.2\(2\)](#)

22 [2018 IRC Table R301.2\(3\)](#)

23 [2015 IBC Section 1405.2](#)

24 <https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4>

25 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#>:-:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

26 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#>:-:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

27 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Body (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited [product certification body](#).

28 See Code of Federal Regulations (CFR) [Title 24 Subtitle B Chapter XX Part 3280](#) for definition.

29 [2018 IFC Section 104.9](#)

30 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC [Section 201.4](#) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.



31 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>

32 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.

33 [2018 IBC Section 1705.12](#)

34 [2018 IBC Section 1705.11](#)

35 <http://www.drjengineering.org/AppendixC> AND <https://www.drjcertification.org/cornell-2016-protection-trade-secrets>

36 <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years>

37 <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided>

38 <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>

39 IBC 2021, Section 1706.1 Conformance to Standards

40 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

41 See Section 11 for the distilled building code definition of **Approved**.

42 Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

43 <https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1>

44 New York City, The Rules of the City of New York, § 101-07 Approved Agencies

45 New York City, The Rules of the City of New York, § 101-07 Approved Agencies

46 https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

47 <https://www.nj.gov/dca/divisions/codes/codreq/ucc.html>

48 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>

49 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>

50 IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

51 IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

52 <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>

53 IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.

54 <https://iaf.nu/en/about-iaf-mia/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope>

55 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

56 <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>