Listing

A Duly Authenticated Report from an Approved Agency

Report No: 2312-02

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HWS SIS Wood Assembly with GWB

Trade Secret Report Holder:

HWS Global

Phone: 844-497-0866 Website: www.hwsglobal.com

CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 05 23.10 - Adhesives

Section: 06 12 00 - Structural Panels

Section: 06 12 19 - Shear Wall Panels

Section: 06 16 00 - Sheathing

Section: 06 16 13 - Insulated Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 - Thermal Insulation

Section: 07 21 13 - Foam Board Insulation

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

Section: 07 26 00 - Vapor Retarders

Section: 07 27 00 - Air Barriers

Section: 07 42 43 - Composite Wall Panels

Section: 07 44 63 - Fabricated Faced Panel Assemblies

Section: 07 48 00 - Exterior Wall Assemblies

Section: 07 84 26 - Thermal Barriers for Plastics

1 Innovative Product Evaluated[1]

1.1 HWS SIS Wood Assembly with Interior Gypsum Wallboard (H-SIS-WAG)

1.1.1 This product has been evaluated and is an alternative material, design procedure and method of construction that is equivalent to all regulations evaluated.

1.1.2 Quality control, third party inspection, and installation shall be in accordance with this duly authenticated report and the manufacturer documentation.

1.1.3 The installation instructions shall be made available to the building official to meet the requirement that the building official shall make inspections as set forth in specific regulations the building official is authorized and directed to enforce.

1.1.4 Where this product or its application is not approved, the building official shall respond in writing, stating the reasons and specific regulations for which the alternative was not approved.

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2 Product Description and Materials

2.1 The innovative product evaluated in this report is shown in **Figure 1**.

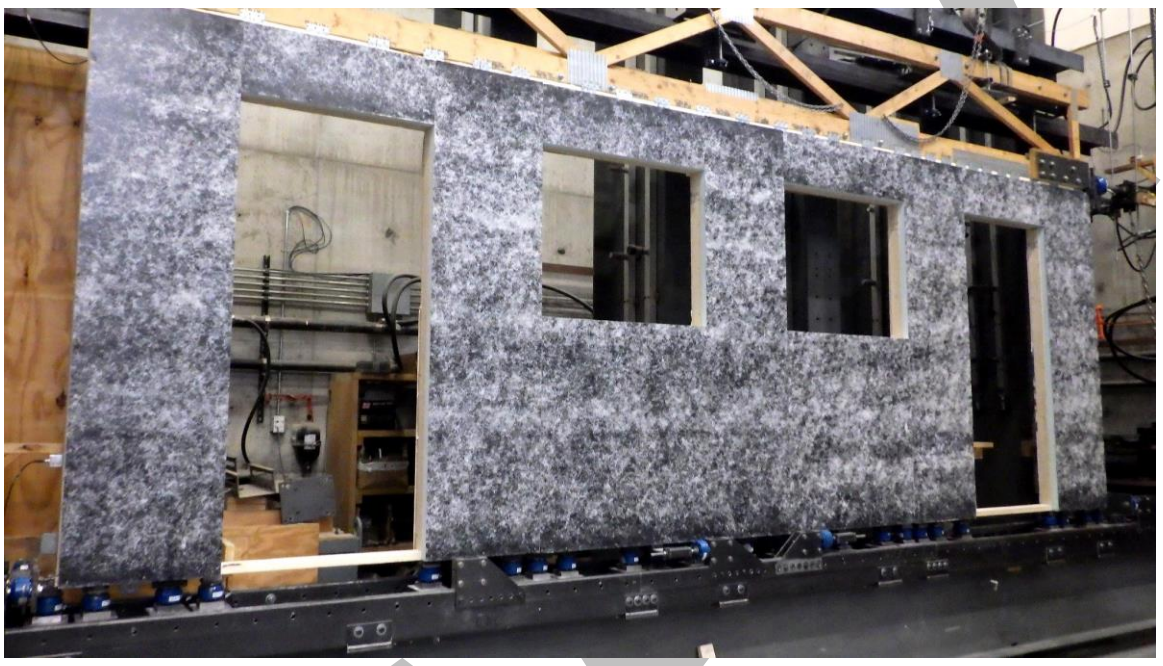

Figure 1. HWS SIS Wood Assembly with Interior Gypsum Wallboard (H-SIS-WAG) – Wall Application

2.2 *H-SIS-WAG Assembly Overview*

2.2.1 *H-SIS-WAG 2" Exterior Sheathing Panel:*

2.2.1.1 $^{1}/_{8}$" H-SIS-WAG laminate adhered to a minimum 2" proprietary XPS foam sheathing with a proprietary low VOC, urethane adhesive.

2.2.2 *H-SIS-WAG Interior Sheathing Panel:*

2.2.2.1 Minimum $^{1}/_{2}$" gypsum wallboard complying with ASTM C1396.

2.3 H-SIS-WAG is described in **Table 1** and **Table 2**.

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Table 1. Description of H-SIS-WAG from Exterior to Interior

Product	Component(s)	Description	Specifications	Connection
H-SIS-WAG Exterior Sheathing	H-SIS-WAG Laminate	Proprietary carbon-based laminate	1/8" thick laminate with a minimum tensile strength[1] of 12,000 psi.	H-SIS-WAG exterior sheathing is fastened to structural members with one #9 x 3" truss head self-drilling screw at each exterior sheathing panel corner. Additionally, proprietary polyurethane foam construction adhesive is applied along the length of all structural members to achieve full coverage of structural members after application of the H-SIS-WAG exterior sheathing per HWS assembly instructions and quality control.
	Foam	Proprietary Extruded Polystyrene (XPS) Foam Sheathing	2" thick XPS Minimum properties: 1.5 pcf density 20 psi compressive strength, F_c 50 psi tensile strength, F_t 25 psi shear strength, F_v 50 psi flexural strength, F_b 1,600 psi flexural modulus, MOE	
H-SIS-WAG Structural Framing Member	Wooden Members	Minimum 2 x 4 No. 2 SPF (minimum Specific Gravity [SG] of 0.42) grade marked lumber applied at a maximum of 24" on-center (o.c.)	Other lumber types, grades and sizes can be used if their design values are equal to or better than 2 x 4 No. 2 SPF	(3) Nails 3" x 0.131" per structural member are required at top/bottom plates when used in walls and for rim board attachment when used in floors or roofs.
Interior Sheathing	Gypsum Wallboard (GWB)	GWB complying with ASTM C1396	Minimum 1/2" thickness	GWB fastened to structural members with #6 x 1 1/4" Type S screws 16" o.c at panel edges and 16" o.c. in the field (16:16).

SI: 1 in = 25.4 mm, 1 psi = 6.895 kPa, 1 pcf = 16.02 kg/m^3

1. Per ASTM D638.

Table 2. H-SIS-WAG Details[1]

Product	Assembly Details		
	Exterior Sub-Assembly	Framing Member[2]	Interior Sheathing
6" H-SIS-WAG	2" H-SIS-WAG Exterior Sheathing	2 x 4 Solid Sawn Lumber	1/2" GWB Interior Sheathing
8" H-SIS-WAG	2 H-SIS-WAG Exterior Sheathing	2 x 6 Solid Sawn Lumber	1/2" GWB Interior Sheathing
10" H-SIS-WAG	2" H-SIS-WAG Exterior Sheathing	2 x 8 Solid Sawn Lumber	1/2" GWB Interior Sheathing
12" H-SIS-WAG	2" H-SIS-WAG Exterior Sheathing	2 x 10 Solid Sawn Lumber	1/2" GWB Interior Sheathing

1. Listed sheathing thicknesses are minimums. Thicker sheathing is permitted.
2. Framing members shall have a minimum published specific gravity of 0.42.

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2.4 As needed, review material properties for design in **Section 6**.

2.4.1 **Section 6** provides tabulated properties to create end use application solutions, which are to be used in the design of a building structural system that provides a complete load path to meet the requirements for the transfer of loads from their point of origin through all load-resisting elements and connections to the foundation.

3 Definitions

3.1 New Materials[2] 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 tests[4] and/or engineering analysis.[5]

3.2 Duly authenticated reports[6] and research reports[7] are test reports and related engineering evaluations that are written by an approved agency[8] and/or an approved source.[9]

3.2.1 These reports utilize intellectual property and/or trade secrets to create public domain material properties for commercial end-use.

3.2.1.1 This report protects confidential Intellectual Property and trade secretes under the regulation, 18.US.Code.90, also known as Defend Trade Secrets Act of 2016 (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, hereinafter 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 ANAB[12] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[13] 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 writing[14] 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] and can be used in any country that is an MLA signatory found at this link: https://iaf.nu/en/recognised-abs/

3.9 Approval equity is a fundamental commercial and legal principle.[18]

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4 Applicable Local, State, and Federal Approvals; Standards; Regulations for the Listing[19]

4.1 *Local, State, and Federal Regulations*

4.1.1 Approved in all local jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which include the following featured local jurisdictions and are not limited to: Austin, Baltimore, Broward County, Chicago, Clark County, Dade County, Dallas, Detroit, Denver, DuPage County, Fort Worth, Houston, Kansas City, King County, Knoxville, Las Vegas, Los Angeles City, Los Angeles County, Miami, Nashville, New York City, Omaha, Philadelphia, Phoenix, Portland, San Antonio, San Diego, San Jose, San Francisco, Seattle, Sioux Falls, South Holland, Texas Department of Insurance, and Wichita.

4.1.2 Approved in all state jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which include the following featured states and are not limited to: California, Florida, New Jersey, New York, Oregon Texas, Washington, and Wisconsin.

4.1.3 *IBC – 18, 21, 24: International Building Code®*

4.1.4 *IRC – 18, 21, 24: International Residential Code®*

4.1.5 *IECC – 18, 21, 24: International Energy Conservation Code®*

4.1.6 Approved by the Code of Federal Regulations Manufactured Home Construction: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[20] and Part 3280[21] pursuant to the use of ISO/IEC 17065 duly authenticated reports.

4.2 *Standards*

4.2.1 *ASTM C297: Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions*

4.2.2 *ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*

4.2.3 *ASTM C1396: Standard Specification for Gypsum Board*

4.2.4 *ASTM C1860: Standard Test Methods for Measurement of Tensile Strength or Bond Strength of Portland Cement-Based Plaster by Direct Tension*

4.2.5 *ASTM D779: Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method*

4.2.6 *ASTM D882: Standard Test Method for Tensile Properties of Thin Plastic Sheeting*

4.2.7 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*

4.2.8 *ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*

4.2.9 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

4.2.10 *ASTM E96: Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials*

4.2.11 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*

4.2.12 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*

4.2.13 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*

4.2.14 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*

4.2.15 *ASTM E2556: Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment*

4.2.16 *NFPA 13: Standard for the Installation of Sprinkler Systems*

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4.2.17 *NFPA 13D: Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*

4.2.18 *NFPA 13R: Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*

4.2.19 *UL 723: Test for Surface Burning Characteristics of Building Materials*

4.2.20 *UL 1715: Fire Test of Interior Finish Material*

4.3 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 following standards:

4.3.1 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

4.3.2 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*

4.3.2.1 ASTM D7989 is accepted engineering practice used to establish Seismic Design Coefficients (SDC).

4.3.2.2 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.

4.3.2.3 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.

4.3.3 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*

4.3.4 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*

5 Listed[22]

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 and 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 *General*

6.1.1 H-SIS-WAG assemblies are used in the following applications:

6.1.1.1 Walls in buildings constructed in accordance with the applicable sections in the IBC and IRC.

6.1.1.2 Structural wall panels to provide lateral load resistance (wind and seismic) for buildings.

6.1.1.3 Structural wall panels to provide resistance to transverse loads for wall assemblies.

6.1.1.4 Structural wall panels to provide resistance to axial loads for wall assemblies.

6.1.1.5 Structural wall panels in buildings constructed in accordance with the IBC requirements for Type V construction.

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6.2 *Prescriptive Wall Applications in accordance with IRC*

6.2.1 *Prescriptive Residential Design - Simplified Wall Bracing using H-SIS-WAG Assemblies:*

6.2.1.1 H-SIS-WAG are permitted for use as an alternative to the exterior wall assemblies sheathed with Wood Structural Panels (WSP) specified in the IRC.

6.2.1.2 When using **Table 3** and **Table 4**, the following requirements apply to (please also refer to **Table 1** and **Table 2**):

6.2.1.2.1 A minimum 2 x 4 No. 2 SPF grade marked lumber is required to be applied at a maximum of 24" o.c.

6.2.1.2.2 Other species, grades, and sizes can be used if their design values are equal to or better than 2 x 4 No. 2 grade SPF.

6.2.1.2.3 The exterior sheathing, with the laminate facing the exterior, is fastened to each structural member with #9 x 3" screws at 12" o.c. spacing around the perimeter and 12" o.c. in the field.

6.2.1.2.4 A $^{3}/_{8}$" bead of a proprietary construction adhesive is applied to each structural member along the length of the structural member and top/bottom plates/rim boards.

6.2.1.2.5 The foam sheathing side (e.g., non-laminate side) is adhered to structural members, post glue application.

6.2.1.2.6 Any unsupported H-SIS-WAG exterior sheathing edges or ends need to be supported by a structural member.

6.2.1.2.7 All panel edges and ends require the exterior sheathing to be glued and attached to a structural member.

6.2.1.2.8 Three (3) nails, 3" x 0.131" per structural member, are required at top/bottom plates when used in walls and for rim board attachment when used in floors or roofs.

6.2.1.2.9 A minimum $^{1}/_{2}$" GWB is attached to the interior side of the wall to the structural members.

6.2.1.2.9.1 The GWB is fastened with #6 x $1^{1}/_{4}$" Type W screws at 16" o.c. spacing around the perimeter and 16" o.c. in the field.

6.2.1.2.9.2 Any unsupported GWB edges or ends need to be supported by a structural member.

6.2.1.3 All connections will need to be designed separately to transfer load from the H-SIS-WAG to other structural members to the foundation. Please refer to the manufacturer details and installation instructions.

6.2.1.4 All provisions of the IRC simplified bracing method shall be met when using **Table 3** and **Table 4**, where **Table 3** and **Table 4** replace IRC language and tables, as relevant.

6.2.1.4.1 ***Note:*** A bracing unit refers to a full-height segment of the H-SIS-WAG wall assembly without openings or vertical/horizontal offsets and a minimum length of 48".

6.2.1.5 **Table 3** and **Table 4** are based on the provisions of IRC Section R602.12. All provisions therein shall be observed, except that this table shall replace IRC Table R602.12.4, and H-SIS-WAG shall replace specified wall assembly.

6.2.1.5.1 Minimum $^{1}/_{2}$" GWB fastened 16":16" attached to the interior side of the wall in accordance with IRC Section R702.3.5 and IRC Table R702.3.5.

6.2.1.6 Cripple walls or wood-framed basement walls in a walk-out condition shall be designated as the first story, and the stories above shall be re-designated as the second and third stories, respectively, and shall be prohibited in a three-story structure.

6.2.1.7 Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using **Table 3** and **Table 4**.

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Table 3. Minimum Bracing Units (4′ Sections) of H-SIS-WAG for 16" o.c. Stud Spacing [1,2,3]

Minimum Product Thickness (in)	Ultimate Design Wind Speed	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units/ft of Bracing Required (Long Side)						Minimum Number of Bracing Units/ft of Bracing Required (Short Side)					
				Length of Short Side						Length of Long Side					
				10	20	30	40	50	60	10	20	30	40	50	60
6" Wide H-SIS-WAG	115	One Story or Top of Two Story or Three Story	10	1	1	2	2	3	3	1	1	2	2	3	3
		First of Two Story or Second of Three Story		1	2	3	4	4	5	1	2	3	4	4	5
		First of Three Story		2	3	4	5	6	7	2	3	4	5	6	7
		One Story or Top of Two Story or Three Story	15	1	1	3	3	4	4	1	1	3	3	4	4
		First of Two Story or Second of Three Story		1	2	3	5	5	6	1	2	3	5	5	6
		First of Three Story		2	3	4	6	7	8	2	3	4	6	7	8
	130	One Story or Top of Two Story or Three Story	10	1	2	2	3	3	4	1	2	2	3	3	4
		First of Two Story or Second of Three Story		2	3	4	5	6	6	2	3	4	5	6	6
		First of Three Story		2	4	5	7	8	9	2	4	5	7	8	9
		One Story or Top of Two Story or Three Story	15	1	3	3	4	4	5	1	3	3	4	4	5
		First of Two Story or Second of Three Story		2	3	5	6	7	7	2	3	5	6	7	7
		First of Three Story		2	4	6	8	9	10	2	4	6	8	9	10

SI: 1 ft = 0.305 m, 1 mph = 1.61 km/h

1. Interpolation shall not be permitted.
2. For Exposure Category C, multiply bracing units by a factor of 1.20 for a one-story building, 1.30 for a two-story building, and 1.40 for a three-story building.
3. Maximum stud spacing is 16" o.c.

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Table 4. Minimum Bracing Units (4′ Sections) of H-SIS-WAG for 24" o.c. Stud Spacing[1,2,3]

Minimum Product Thickness (in)	Ultimate Design Wind Speed	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units/ft of Bracing Required (Long Side)						Minimum Number of Bracing Units/ft of Bracing Required (Short Side)					
				Length of Short Side						Length of Long Side					
				10	20	30	40	50	60	10	20	30	40	50	60
6" Wide H-SIS-WAG	115	One Story or Top of Two Story or Three Story	10	1	2	2	3	3	4	1	2	2	3	3	4
		First of Two Story or Second of Three Story		2	3	4	5	6	7	2	3	4	5	6	7
		First of Three Story		2	4	5	7	8	9	2	4	5	7	8	9
		One Story or Top of Two Story or Three Story	15	1	3	3	4	4	5	1	3	3	4	4	5
		First of Two Story or Second of Three Story		2	3	5	6	7	8	2	3	5	6	7	8
		First of Three Story		2	4	6	8	9	10	2	4	6	8	9	10
	130	One Story or Top of Two Story or Three Story	10	1	2	3	3	4	5	1	2	3	3	4	5
		First of Two Story or Second of Three Story		2	3	5	6	7	8	2	3	5	6	7	8
		First of Three Story		3	5	7	8	10	12	3	5	7	8	10	12
		One Story or Top of Two Story or Three Story	15	1	3	4	4	5	7	1	3	4	4	5	7
		First of Two Story or Second of Three Story		2	3	6	7	8	9	2	3	6	7	8	9
		First of Three Story		3	6	8	9	11	13	3	6	8	9	11	13

SI: 1 ft = 0.305 m, 1 mph = 1.61 km/h

1. Interpolation shall not be permitted.
2. For Exposure Category C, multiply bracing units by a factor of 1.20 for a one-story building, 1.30 for a two-story building, and 1.40 for a three-story building.
3. Maximum stud spacing is 24" o.c.

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6.2.2 *Prescriptive Residential Design - Minimum Total Length (ft) of Bracing Required Along Each Braced Wall Line using H-SIS-WAG Assemblies – Wind:*

6.2.2.1 H-SIS-WAG may be used on braced wall lines as an equivalent alternative to the IRC Method WSP and Method CS-WSP wall assemblies when installed in accordance with IRC Section R602.10 and this Listing.

6.2.2.2 For wind design, required braced wall panel lengths for H-SIS-WAG shall be as shown in **Table 5** and **Table 6**, and shall be used in conjunction with IRC Table R602.10.3(2), which provides the required adjustments.

6.2.2.2.1 Generally, for H-SIS-WAG the continuous insulation portion of this table will be used. There may be times when other sheathing types are required to resist lateral loads. For assistance with intermittent sheathing design, please call the H-SIS-WAG manufacturer.

6.2.2.2.2 H-SIS-WAG constructed as described in **Table 1**, **Table 2**, and **Section 8**.

6.2.2.2.2.1 Minimum $^1/_2$" GWB spaced 16":16" (edge:field) shall be installed as part of the wall assembly.

6.2.2.3 Demonstrates equivalency to IRC Table R602.10.3(1).

Table 5. Minimum Length of H-SIS-WAG Required Along Each Braced Wall Line with Studs Spaced 16" o.c. - Wind[1,2,3]

Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	<1 40	< 95	≤ 110	≤ 115	≤ 120	≤ 130	< 140
One Story or the Top of Two or Three Stories	10	1.4	1.9	1.9	2.4	2.4	2.9	1.4	1.4	1.9	1.9	2.4	2.4
	20	2.4	3.4	3.4	3.8	4.8	5.3	2.4	2.9	3.4	3.4	3.8	4.8
	30	3.8	4.8	5.3	5.8	6.7	7.7	3.4	4.3	4.3	4.8	5.8	6.7
	40	4.8	6.2	6.7	7.7	8.6	10.1	3.8	5.3	5.8	6.2	7.2	8.6
	50	5.8	7.7	8.6	9.1	10.6	12.5	4.8	6.7	7.2	7.7	9.1	10.6
	60	6.7	9.1	10.1	11.0	12.5	14.4	5.8	7.7	8.6	9.1	10.6	12.5
First Story of Two Stories or Second Story of Three Stories	10	2.9	3.4	3.8	4.3	4.8	5.8	2.4	2.9	3.4	3.4	4.3	4.8
	20	4.8	6.2	7.2	7.7	9.1	10.6	4.3	5.3	6.2	6.7	7.7	8.6
	30	6.7	9.1	10.1	11.0	13.0	14.9	5.8	7.7	8.6	9.1	11.0	12.5
	40	9.1	12.0	13.0	14.4	16.8	19.2	7.7	10.1	11.0	12.0	14.9	16.3
	50	11.0	14.9	15.8	17.3	20.6	23.5	9.6	12.5	13.4	14.9	17.3	20.2
	60	13.0	17.3	19.2	20.6	24.0	27.8	11.0	14.9	16.3	17.8	20.6	24.0

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Table 5. Minimum Length of H-SIS-WAG Required Along Each Braced Wall Line with Studs Spaced 16" o.c. - Wind[1,2,3]

Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	<1 40	< 95	≤ 110	≤ 115	≤ 120	≤ 130	< 140
First Story of Three Stories	10	3.8	5.3	5.8	6.2	7.2	8.2	3.4	4.3	4.8	5.3	6.2	7.2
	20	7.2	9.6	10.6	11.0	13.0	15.4	6.2	8.2	8.6	9.6	11.0	13.0
	30	10.1	13.4	14.9	16.3	18.7	22.1	8.6	11.5	12.5	13.9	16.3	18.7
	40	13.0	17.8	19.2	21.1	24.5	28.3	11.0	14.9	16.3	17.8	21.1	24.0
	50	16.3	21.6	23.5	25.9	30.2	35.0	13.9	18.2	20.2	22.1	25.4	29.8
	60	19.2	25.4	27.8	30.7	36.0	41.3	16.3	22.1	24.0	25.9	30.2	35.0

SI: 1 ft = 0.305 m, 1 mph = 1.61 km/h

1. Linear interpolation is permitted.
2. Maximum stud spacing is 16" o.c.
3. Wind speeds are V_{ult} in accordance with ASCE 7-22. Convert to equivalent V_{asd} wind speed per IBC Section 1609.3.1: $V_{asd} = V_{ult}\sqrt{0.6}$

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Table 6. Minimum Length of H-SIS-WAG Required Along Each Braced Wall Line with Studs Spaced 24" o.c. – Wind[1,2,3]

Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	< 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	< 140
One Story or the Top of Two Stories or Three Stories	10	1.9	2.5	2.5	3.1	3.1	3.7	1.9	1.9	2.5	2.5	3.1	3.1
	20	3.1	4.3	4.3	5.0	6.2	6.8	3.1	3.7	4.3	4.3	5.0	6.2
	30	5.0	6.2	6.8	7.4	8.7	9.9	4.3	5.6	5.6	6.2	7.4	8.7
	40	6.2	8.1	8.7	9.9	11.2	13.0	5.0	6.8	7.4	8.1	9.3	11.2
	50	7.4	9.9	11.2	11.8	13.6	16.1	6.2	8.7	9.3	9.9	11.8	13.6
	60	8.7	11.8	13.0	14.3	16.1	18.6	7.4	9.9	11.2	11.8	13.6	16.1
First Story of Two Stories or Second Story of Three Stories	10	3.7	4.3	5.0	5.6	6.2	7.4	3.1	3.7	4.3	4.3	5.6	6.2
	20	6.2	8.1	9.3	9.9	11.8	13.6	5.6	6.8	8.1	8.7	9.9	11.2
	30	8.7	11.8	13.0	14.3	16.7	19.2	7.4	9.9	11.2	11.8	14.3	16.1
	40	11.8	15.5	16.7	18.6	21.7	24.8	9.9	13.0	14.3	15.5	19.2	21.1
	50	14.3	19.2	20.5	22.3	26.7	30.4	12.4	16.1	17.4	19.2	22.3	26.0
	60	16.7	22.3	24.8	26.7	31.0	36.0	14.3	19.2	21.1	22.9	26.7	31.0
First Story of Three Stories	10	5.0	6.8	7.4	8.1	9.3	10.5	4.3	5.6	6.2	6.8	8.1	9.3
	20	9.3	12.4	13.6	14.3	16.7	19.8	8.1	10.5	11.2	12.4	14.3	16.7
	30	13.0	17.4	19.2	21.1	24.2	28.5	11.2	14.9	16.1	18.0	21.1	24.2
	40	16.7	22.9	24.8	27.3	31.6	36.6	14.3	19.2	21.1	22.9	27.3	31.0
	50	21.1	27.9	30.4	33.5	39.1	45.3	18.0	23.6	26.0	28.5	32.9	38.4
	60	24.8	32.9	36.0	39.7	46.5	53.3	21.1	28.5	31.0	33.5	39.1	45.3

SI: 1 ft = 0.305 m, 1 mph = 1.61 km/h

1. Linear interpolation is permitted.
2. Maximum stud spacing is 24" o.c.
3. Wind speeds are V_{ult} in accordance with ASCE 7-22. Convert to equivalent V_{asd} wind speed per IBC Section 1609.3.1: $V_{asd} = V_{ult}\sqrt{0.6}$

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6.2.3 *Prescriptive Residential Design - Minimum Total Length (ft) of Bracing Required Along Each Braced Wall Line using H-SIS-WAG Assemblies – Seismic:*

6.2.3.1 For seismic design, required braced wall panel lengths for H-SIS-WAG shall be as shown in **Table 8**, and shall be used in conjunction with IRC Table R602.10.3(4), which provides the required adjustments.

6.2.3.1.1 Generally, for H-SIS-WAG the continuous insulation portion of this table will be used. There may be times when other sheathing types are required to resist lateral loads. For assistance with intermittent sheathing design, please call the H-SIS-WAG manufacturer.

6.2.3.1.2 H-SIS-WAG constructed as described in **Table 1**, **Table 2**, and **Section 8**.

6.2.3.1.2.1 Minimum $^1/_2$" GWB spaced 16":16" (edge:field) shall be installed as part of the wall assembly.

6.2.3.2 Demonstrates equivalency to IRC Table R602.10.3(3).

Table 7. Minimum Length of H-SIS-WAG Required Along Each Braced Wall Line with Studs Spaced 16" o.c. - Seismic[1,2,3]

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line							
		Intermittent Sheathing				Continuous Sheathing			
		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	1.6	1.7	1.9	2.4	1.4	1.6	1.6	2.0
	20	3.1	3.5	3.8	4.8	2.6	2.9	3.3	4.1
	30	4.6	5.2	5.8	7.2	4.0	4.4	4.9	6.1
	40	6.1	6.9	7.7	9.6	5.2	5.9	6.6	8.1
	50	7.7	8.6	9.6	12.0	6.6	7.3	8.1	10.2
First Story of Two Stories or Second Story of Three Stories	10	2.9	3.6	4.3	5.3	2.5	3.1	3.6	4.5
	20	5.8	7.2	8.6	10.5	4.9	6.1	7.3	9.0
	30	8.6	10.9	13.0	15.8	7.3	9.2	11.0	13.5
	40	11.5	14.4	17.3	21.1	9.8	12.3	14.7	18.0
	50	14.4	18.0	21.6	26.4	12.3	15.4	18.3	22.5
First Story of Three Stories	10	4.3	5.1	5.8	NP	3.6	4.3	4.9	NP
	20	8.6	10.1	11.5	NP	7.3	8.6	9.8	NP
	30	13.0	15.2	17.3	NP	11.0	12.9	14.7	NP
	40	17.3	20.1	23.0	NP	14.7	17.2	19.6	NP
	50	21.6	25.2	28.8	NP	18.3	21.4	24.5	NP

SI: 1 ft = 0.305 m

1. NP = Not Permitted.
2. Linear interpolation is permitted.
3. Maximum stud spacing is 16" o.c.

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Table 8. Minimum Length of H-SIS-WAG Required Along Each Braced Wall Line with Framing Members Spaced 24" o.c. - Seismic[1,2,3]

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line							
		Intermittent Sheathing				Continuous Sheathing			
		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	2.0	2.2	2.5	3.1	1.8	2.0	2.1	2.6
	20	3.9	4.5	5.0	6.2	3.4	3.8	4.2	5.3
	30	6.0	6.7	7.4	9.3	5.1	5.7	6.3	7.9
	40	7.9	8.9	9.9	12.4	6.7	7.6	8.5	10.5
	50	9.9	11.1	12.4	15.5	8.5	9.5	10.5	13.1
First Story of Two Stories or Second Story of Three Stories	10	3.7	4.7	5.6	6.9	3.2	3.9	4.7	5.8
	20	7.4	9.3	11.1	13.6	6.3	7.9	9.5	11.7
	30	11.1	14.0	16.7	20.4	9.5	11.9	14.3	17.4
	40	14.9	18.5	22.3	27.3	12.6	15.9	19.0	23.2
	50	18.5	23.3	27.9	34.1	15.9	19.9	23.7	29.0
First Story of Three Stories	10	5.6	6.6	7.4	NP	4.7	5.6	6.3	NP
	20	11.1	13.0	14.9	NP	9.5	11.1	12.6	NP
	30	16.7	19.6	22.3	NP	14.3	16.7	19.0	NP
	40	22.3	26.0	29.8	NP	19.0	22.2	25.3	NP
	50	27.9	32.6	37.2	NP	23.7	27.6	31.6	NP

SI: 1 ft = 0.305 m

1. NP = Not Permitted.
2. Linear interpolation is permitted.
3. Maximum stud spacing is 24" o.c.

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6.2.4 *H-SIS-WAG Equivalency Factor to IRC Wall Bracing Provisions:*

6.2.4.1 **Table 9** provides an equivalency factor that can be used to adjust the IRC bracing tables for use with H-SIS-WAG.

6.2.4.2 Simply multiply the bracing lengths derived from the IRC Table R602.10.3(1) and IRC Table R602.10.3(3), including all adjustments found in IRC Table R602.10.3(2) and IRC Table R602.10.3(4), respectively.

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

Table 9. H-SIS-WAG Equivalency Factor to IRC Wall Bracing Provisions

Product	Maximum Stud Spacing (in)	Fastener[1,2]	Maximum Fastener Spacing (edge:field) (in)	Gypsum Wallboard Fastening Spacing[3] (edge:field) (in)	Equivalency Factors to IRC Method WSP or IRC Method CS-WSP Wall Assemblies[1,2]
Minimum 6" H-SIS-WAG	16 o.c.	#9 x 3" Screw Plus Adhesive	12:12	16:16	0.96
	24 o.c.				1.24

SI: 1 in = 25.4 mm

1. H-SIS-WAG tested equivalency factors allow the user to determine the length of bracing required, by multiplying the factor by the length of bracing shown in the WSP or CS-WSP columns in IRC Table R602.10.3(1) and IRC Table R602.10.3(3), as modified by all applicable factors in IRC Table R602.10.3(2) and IRC Table R602.10.3(4), respectively.
2. Structural framing members shall have a minimum published specific gravity of 0.42.
3. GWB shall be installed on the interior of the assembly according to the provisions listed in IRC Table R702.3.5.

6.3 *Structural Applications*

6.3.1 The following design values in this report are based on the Allowable Stress Design (ASD) method as permitted by the applicable IBC and IRC code sections and referenced standards listed in **Section 4**.

6.3.2 *Lateral Load Diaphragm Shear Resistance for Wall, Floor, and Roof Applications:*

6.3.2.1 For wind design, the allowable design values for H-SIS-WAG used in lateral (shear) applications are shown in **Table 10**. Walls shall be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in **Table 10, Table 11,** and **Table 12**.

Table 10. H-SIS-WAG Allowable (ASD) Unit Diaphragm Shear Capacity – Wind[1]

Assembly Size	Maximum Structural Member Spacing (in)	Proprietary Foam Sheathing Panel to Stud Fastener/ Spacing (edge/field) (in)	Gypsum Wallboard (GWB)	Fastening Schedule	Allowable Unit Shear Capacity (plf)	Apparent Shear Stiffness (kip/in)
Minimum 6" H-SIS-WAG	16 o.c.	Minimum #9 x 3" Screw 12":12" plus Adhesive	1/2"	Minimum #6 x 1 1/4" Type S or W spaced 16":16"	380	9.6
	24 o.c.				295	6.3

SI: 1 in = 25.4 mm, 1 plf = 0.0146 kN/m, 1 kip/in = 175 N/mm

1. Where higher capacities are needed for structural member spacing less than 16" on center, an engineered design may be used.

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6.3.2.2 For seismic design, the allowable design values for H-SIS-WAG used in lateral (shear) applications are shown in **Table 11**.

Table 11. H-SIS-WAG Allowable (ASD) Unit Diaphragm Shear Capacity – Seismic[1,2]

Seismic Force Resisting System	Maximum Stud Spacing (in)	GWB Fastening Spacing[2] (edge:field) (in)	Seismic Allowable Unit Shear Capacity (plf)	Apparent Shear Stiffness, G_a (kips/in)	Response Modification Factor, R	System Over-strength Factor, Ω_0	Deflection Amplification Coefficient, C_d	Structural System Limitations and Building Height Limit (ft)				
								SDC				
								B	C	D	E	F
Minimum 6" H-SIS-WAG	16 o.c.	16:16	310	11.6	2.0	2.5	2.0	NL	NL	35	NP	NP
	24 o.c.		220	7.6								

SI: 1 in = 25.4 mm, 1 plf = 0.0146 kN/m, 1 kip/in = 175 N/mm

1. NL= Not Limited. NP = Not Permitted.
2. Where higher capacities are needed for structural member spacing less than 16" on center, an engineered design may be used. For assistance with H-SIS-WAG specialty engineered designs please contact HWS Global.

6.3.2.3 Shear walls are permitted to be designed in accordance with the methodology found in 2015 SDPWS Section 4.3.3.5 and 2021 SDPWS Section 4.3.5.6 except as follows:

6.3.2.3.1 2015 SDPWS Equation 4.3-5 and 2021 SDPWS Equation 4.3-6 for C_0 shall be replaced with the equations in **Table 12**.

6.3.2.3.2 The maximum aspect ratio for full height braced wall segments shall be 4:1, instead of 3.5:1 as listed in 2015 SDPWS Table 4.3.4 per Section 4.3.4.3 and 2021 SDPWS Table 4.3.3 per Section 4.3.3.3. The other requirements of SDPWS Section 4.3 shall be followed, including the adjustment factor for aspect ratio of perforated shear wall segments greater than 2:1 found in 2015 SDPWS Section 4.3.4.3 and 2021 SDPWS Section 4.3.3.3.

Table 12. H-SIS-WAG Modified SDPWS C_0 Equations[1]

Structural Assembly Type	SDPWS Version, Equation	Replace with the Following
Minimum 6" H-SIS-WAG	2015 SDPWS, Eq 4.3-5	$C_0 = \frac{r}{(0.83 - 0.17r)} \cdot \frac{L_{tot}}{\sum L_i}$
	2021 SDPWS, Eq 4.3-6	$C_0 = \frac{A_{wall}}{0.83A_0 + A_{fhs}}$

1. For assistance with H-SIS-WAG perforated diaphragm shear designs please contact HWS Global.

6.3.2.4 For floor and roof diaphragm design, the requirements of SDPWS Section 4.2 for blocked diaphragms shall be followed.

6.3.2.5 Shear capacity adjustment factors determined in accordance with the equations in **Table 12** are applicable to perforated wall, floor, and roof applications with lateral load applied to one chord.

6.3.3 *Transverse Load Resistance:*

6.3.3.1 The maximum allowable transverse load resistance capacities for various deflection limits and structural member spacings are shown in **Table 13** (16" o.c.) and **Table 14** (24" o.c.).

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Table 13. Allowable Transverse Load (psf) for H-SIS-WAG with 16" o.c. Stud Spacing[1]

Assembly Size	Span (ft)	Maximum Allowable Load (psf)	Allowable Load at Various Deflection Limits (psf)				
			L/120	L/180	L/240	L/360	L/480
6" H-SIS-WAG	2	880	880	880	880	880	880
	4	440	440	440	440	295	220
	6	220	220	175	130	90	65
	8	125	110	75	55	35	30
	9	95	80	50	40	25	20
	10	80	55	40	30	20	15
	11	65	45	30	20	15	10
	12	55	35	20	15	10	10
8" H-SIS-WAG	2	1,120	1,120	1,120	1,120	1,120	1,120
	4	560	560	560	560	560	560
	6	315	315	315	315	235	175
	8	180	180	180	150	100	75
	9	140	140	140	105	70	50
	10	115	115	100	75	50	40
	11	95	95	75	55	40	30
	12	80	80	60	45	30	20
10" H-SIS-WAG	6	425	425	425	425	425	370
	8	240	240	240	240	210	155
	9	190	190	190	190	145	110
	10	155	155	155	155	105	80
	11	125	125	125	120	80	60
	12	105	105	105	95	60	45
12" H-SIS-WAG	6	410	410	410	410	410	410
	8	310	310	310	310	310	310
	9	255	255	255	255	255	220
	10	205	205	205	205	205	160
	11	170	170	170	170	160	120
	12	145	145	145	145	125	90

SI: 1 in = 25.4 mm, 1 ft. = 30.48 cm, 1 psi = 0.00689 MPa, 1 psf = 0.993 MPa

1. To install the H-SIS-WAG assembly, for any specific floor, wall or roof application, it is required to implement all of **Section 8**.

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Table 14. Allowable Transverse Load (psf) for H-SIS-WAG with 24" o.c. Stud Spacing[1]

Assembly Size	Span (ft)	Maximum Allowable Load (psf)	Allowable Load at Various Deflection Limits (psf)				
			L/120	L/180	L/240	L/360	L/480
6" H-SIS-WAG	2	585	585	585	585	585	585
	4	295	295	295	295	200	150
	6	145	145	115	90	60	45
	8	80	75	50	35	25	20
	9	65	50	35	25	15	15
	10	50	40	25	20	15	10
	11	45	30	20	15	10	5
	12	35	20	15	10	5	5
8" H-SIS-WAG	2	750	750	750	750	750	750
	4	375	375	375	375	375	375
	6	210	210	210	210	155	120
	8	120	120	120	100	65	50
	9	95	95	95	70	45	35
	10	75	75	70	50	35	25
	11	65	65	50	40	25	20
	12	55	55	40	30	20	15
10" H-SIS-WAG	6	285	285	285	285	285	245
	8	160	160	160	160	140	105
	9	125	125	125	125	100	75
	10	100	100	100	100	70	55
	11	85	85	85	80	55	40
	12	70	70	70	60	40	30
12" H-SIS-WAG	6	275	275	275	275	275	275
	8	205	205	205	205	205	205
	9	170	170	170	170	170	145
	10	135	135	135	135	135	105
	11	115	115	115	115	105	80
	12	95	95	95	95	80	60

SI: 1 in = 25.4 mm, 1 ft. = 30.48 cm, 1 psi = 0.00689 MPa, 1 psf = 0.993 MPa

1. To install the H-SIS-WAG assembly, for any specific floor, wall, or roof application, it is required to implement all of **Section 8**.

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6.3.4 *Basic Wind Speed (mph) for H-SIS-WAG Used in Exterior Sheathed Assemblies:*

6.3.4.1 The maximum basic wind speed for H-SIS-WAG for various deflection limits used in wall applications are shown in **Table 15** and **Table 16**.

Table 15. Maximum Basic Wind Speed (mph) for H-SIS-WAG with 16" o.c. Stud Spacing[1,2]

Assembly Size	Span (ft)	Basic Wind Speed, V_{ult} (mph)	Basic Wind Speed, V_{ult}, at Various Deflection Limits (mph)				
			L/120	L/180	L/240	L/360	L/480
6" H-SIS-WAG	≤ 6	200	200	200	200	200	200
	8	200	200	200	195	155	145
	9	200	200	185	165	130	120
	10	200	195	165	145	120	100
	11	200	175	145	120	100	85
	12	195	155	120	100	85	85
8" H-SIS-WAG	≤ 8	200	200	200	200	200	200
	9	200	200	200	200	200	185
	10	200	200	200	200	185	165
	11	200	200	200	195	165	145
	12	200	200	200	175	145	120
10" H-SIS-WAG	≤ 11	200	200	200	200	200	200
	12	200	200	200	200	200	175
12" H-SIS-WAG	≤ 12	200	200	200	200	200	200

SI: 1 in = 25.4 mm, 1 ft. = 0.305 m, 1 mph = 1.61 km/h

1. Wind speeds are V_{ult} per ASCE 7-22.
2. Allowable wind speeds are based on the following: Components and Cladding wind loads, Zone 5, Mean roof height 30', Exposure B, 10 sq. ft. effective wind area. See the applicable building code for any adjustment needed for specific building location and configuration.

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Table 16. Maximum Basic Wind Speed (mph) for H-SIS-WAG with 24" o.c. Stud Spacing[1,2]

Assembly Size	Span (ft)	Basic Wind Speed, V_{ult} (mph)	Basic Wind Speed, V_{ult}, at Various Deflection Limits (mph)				
			L/120	L/180	L/240	L/360	L/480
6" H-SIS-WAG	≤ 4	200	200	200	200	200	200
	6	200	200	200	200	200	175
	8	200	200	185	155	130	120
	9	200	185	155	130	100	100
	10	185	165	130	120	100	85
	11	175	145	120	100	85	60
	12	155	120	100	85	60	60
8" H-SIS-WAG	≤ 6	200	200	200	200	200	200
	8	200	200	200	200	200	185
	9	200	200	200	200	175	155
	10	200	200	200	185	155	130
	11	200	200	185	165	130	120
	12	195	195	165	145	120	100
10" H-SIS-WAG	≤ 9	200	200	200	200	200	200
	10	200	200	200	200	200	195
	11	200	200	200	200	195	165
	12	200	200	200	200	165	145
12" H-SIS-WAG	≤ 12	200	200	200	200	200	200

SI: 1 in = 25.4 mm, 1 ft. = 0.305 m, 1 mph = 1.61 km/h

1. Wind speeds are V_{ult} per ASCE 7-22.
2. Allowable wind speeds are based on the following: Components and Cladding wind loads, Zone 5, Mean roof height 30', Exposure B, 10 sq. ft. effective wind area. See the applicable building code for any adjustment needed for specific building location and configuration.

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6.3.5 *Axial Load Resistance:*

6.3.5.1 Structural performance for axial compression resistance are provided in **Table 17**.

Table 17. Allowable (ASD) Gravity Loads for H-SIS-WAG[1]

Composite Panel System	Maximum Structural Member Spacing (in)	Allowable Compression Resistance (plf) for Nominal Wall Heights (ft)						
		8	9	10	11	12	13	14
6" H-SIS-WAG	16 o.c.	1,670	1,590	1,320	1,100	930	800	700
8" H-SIS-WAG		2,630	2,630	2,630	2,630	2,630	2,630	2,630
10" H-SIS-WAG		3,470	3,470	3,470	3,470	3,470	3,470	3,470
12" H-SIS-WAG		4,420	4,420	4,420	4,420	4,420	4,420	4,420
6" H-SIS-WAG	24 o.c.	1,120	1,060	880	730	620	530	460
8" H-SIS-WAG		1,750	1,750	1,750	1,750	1,750	1,750	1,750
10" H-SIS-WAG		2,310	2,310	2,310	2,310	2,310	2,310	2,310
12" H-SIS-WAG		2,950	2,950	2,950	2,950	2,950	2,950	2,950

SI: 1 mil = 0.254 mm, 1 in = 25.4 mm, 1 plf = 0.0146 kN/m

1. Resistance is limited by the lesser of compression perpendicular to grain of the structural members on the bottom plate or panel buckling.

6.3.5.2 Structural performance under axial uplift load conditions are provided in **Table 18**.

Table 18. Allowable (ASD) Uplift Loads for H-SIS-WAG[1]

HWS SIS Wood Assembly	Maximum Structural Member Spacing (in)	Allowable Uplift Resistance (plf)
Minimum 6" H-SIS-WAG	16 o.c.	265
	24 o.c.	200

SI: 1 mil = 0.254 mm, 1 in = 25.4 mm, 1 plf = 0.0146 kN/m

1. Where higher capacities are needed for structural member spacing less than 16" on center, an engineered design may be used. For assistance with H-SIS-WAG specialty engineered designs please contact HWS Global.

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6.3.6 *Pull-Off Resistance of the H-SIS-WAG Proprietary Laminate Attached to Structural Members:*

6.3.6.1 The allowable adhesive bond strength of H-SIS-WAG proprietary laminate adhered to the wood structural members is shown in **Table 19**.

Table 19. Pull-Off Resistance of the H-SIS-WAG Proprietary Laminate

Connection	Allowable Pull-off Resistance of Proprietary Laminate as Attached to Structural Members (psf)
Pull-off resistance of H-SIS-WAG Proprietary Laminate	120
SI: 1 psf = 47.9 Pa	

6.3.7 *Axial Shear Resistance of the Exterior Sheathing Attached to Structural Members at the Structural Member Interface (Gravity):*

6.3.7.1 The allowable axial shear resistance design value of proprietary exterior sheathing at the wood structural member connection interface is shown in **Table 20**.

Table 20. Axial (Gravity) Shear Resistance of the H-SIS-WAG Exterior Sheathing

H-SIS-WAG Exterior Sheathing	Allowable Resistance of the Exterior Sheathing Connection to the Structural Member (Gravity) (psf)
H-SIS-WAG Exterior Sheathing to Structural Member	360
SI: 1 psf = 47.9 Pa	

6.3.8 *Tensile Strength of the Internal Bond of the Proprietary Exterior Sheathing:*

6.3.8.1 The allowable H-SIS-WAG tensile (suction perpendicular to studs) strength of the exterior sheathing is shown in **Table 21**.

Table 21. Tensile Strength of the Internal Bond of the H-SIS-WAG Exterior Sheathing

Component	Allowable Tensile Strength (psi)
H-SIS-WAG Exterior Sheathing[1]	50
SI: 1 psi = 6.89 kPa 1. Tensile strength of the XPS foam portion of the panel.	

6.4 *Building Science*

6.4.1 *Thermal Resistance:*

6.4.1.1 Testing of the foam portion of the H-SIS-WAG Sheathing was conducted in accordance with ASTM C518. Thermal resistance and nominal density are listed in **Table 22**.

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Table 22. R-Value of the Continuous Insulation Component for H-SIS-WAG

Component	R-Value at a Mean Temperature of 75°F (23.9°C)	Density of XPS Foam Sheathing (pcf)
H-SIS-WAG Sheathing	5.0 per inch[1]	2.0

SI: 1 $ft^2 \cdot °F \cdot h/btu = 0.176\ K \cdot m^2/W$

1. Foam sheathing portion of the panels only

6.4.2 *Moisture Vapor Permeance:*

6.4.2.1 The moisture vapor permeance of H-SIS-WAG Exterior Sheathing Components is shown in **Table 23**.

Table 23. Moisture Vapor Permeance of H-SIS-WAG Exterior Sheathing Components[1]

Component	Vapor Permeance
2" H-SIS-WAG Exterior Sheathing	0.66 perm
1" H-SIS-WAG Exterior Sheathing	1.33 perm

1. Tested in accordance with ASTM E96.

6.4.3 *Water-Resistive Barrier:*

6.4.3.1 The water-resistive barrier properties of the exterior sheathing component of the H-SIS-WAG is shown in **Table 24**.

Table 24. Water-Resistive Barrier Performance of the Exterior Sheathing Component of the H-SIS-WAG

Product Description	Standard	Test Result
Minimum 6" H-SIS-WAG	ASTM E2556 - Type II (60 Minute)	Pass

6.5 *Fire Performance*

6.5.1 *Surface Burning Characteristics:*

6.5.1.1 The flame spread and smoke developed index performance of the exterior sheathing component of the H-SIS-WAG is shown in **Table 25**.

Table 25. Surface Burning Characteristics of the H-SIS-WAG Exterior Sheathing Component

Product Description	Flame Spread	Smoke Developed Index	Classification
H-SIS-WAG Proprietary Laminate	≤ 25	≤ 450	Class A
XPS Foam Sheathing	≤ 25	≤ 450	Class A

1. Laminate and XPS tested in accordance with ASTM E84/ UL723.

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6.5.2 *Thermal Barrier*:

6.5.2.1 H-SIS-WAG up to 8" thick may be used without a prescriptive thermal barrier, pursuant to the tested performance found in **Table 26**, when sprinklers are installed according to the requirements of the following sprinkler standards:

6.5.2.1.1 NFPA 13 Standard for the Installation of Sprinkler Systems

6.5.2.1.2 NFPA 13D Standard for the Installation of Sprinkler Systems in One and Two-Family Dwellings and Manufactured Homes

6.5.2.1.3 NFPA 13R Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies

6.5.2.2 Testing of H-SIS-WAG generated the UL1715 test results found in **Table 26**.

6.5.2.2.1 UL 1715 is one of three tests permitted by building codes to show that their fire performance is sufficient for use without a prescriptive thermal barrier. These tests are NFPA 286, UL 1715, and FM 4880.

6.5.2.2.2 Use without a prescriptive thermal barrier requires installation of an NFPA 13, 13D, or 13R sprinkler system with a minimum flow rate of 13 gallons per minute.

Table 26. UL 1715 Tested Performance of H-SIS-WAG for Use as Interior Wall and Ceiling Finish Materials without a Thermal Barrier

Component	Maximum Thickness (in.)	Spread of Flames to Ceiling	Spread of Flames to Outer Extremity of H-SIS-WAG Sheathing	Passes Requirements of UL 1715
H-SIS-WAG Sheathing	8	No	No	Yes
SI: 1 in = 25.4 mm				

6.6 *Impact Resistance (Hail)*

6.6.1 The H-SIS-WAG proprietary laminate used as the exterior face of the H-SIS-WAG exterior sheathing was tested in accordance with UL 2218 to evaluate resistance to damage from hail.

6.6.2 The results of this testing are shown in **Table 27**.

Table 27. Impact Resistance of H-SIS-WAG Sheathing and Laminate

Component	Minimum Component Thickness (in.)	Fastening Method to Structural Framing	Test Classification	Test Result
H-SIS-WAG Proprietary Laminate	1/16	12:12	4	PASS
H-SIS-WAG Proprietary Laminate	1/16	12:12 and proprietary polyurethane foam construction adhesive	4	PASS
2" H-SIS-WAG Exterior Sheathing	Proprietary Laminate: 1/16 Foam: 2	12:12	4	PASS
SI: 1 in = 25.4 mm				

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6.7 *Fastening for Cladding Materials*

6.7.1 Fasteners are required to attach cladding through the H-SIS-WAG sheathing to the wall framing to carry the cladding weight.

6.7.1.1 See **Table 28** and **Table 29** for allowable cladding attachments with various fastener types for light frame wood construction.

6.7.2 The fasteners attaching the cladding through the sheathing to the wall framing shall have a minimum size and maximum spacing as shown in **Table 28** and **Table 29**.

6.7.3 All exterior sheathing panel edges shall be supported by framing or blocking.

6.7.4 For attaching to wood studs, fasteners with design properties equal or greater than the fasteners specified in the following tables shall be permitted.

6.7.5 Minimum fastener penetration wood stud is specified in the tables that follow.

6.7.6 The specified cladding weight shall include all supported materials.

6.7.7 Wood framing shall have a minimum specific gravity of 0.42.

6.7.8 Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.

6.7.9 Cladding material shall be separately checked for fastener head-pull-through.

6.7.10 Wood furring as specified in **Table 29** is permitted to be any softwood species having a specific gravity of at least 0.42.

6.7.10.1 Furring shall be spaced not more than 16" o.c. When installed vertically, furring shall be located over the framing members and attached with the permitted fasteners and spacing. When furring is installed horizontally, the 8" and 12" fastener in the furring shall be achieved by the use of two fasteners into the framing members at 18" o.c.

6.7.10.2 Where the required cladding fastener penetration into wood material exceeds $^1/_2$" and is not more than $1^1/_2$", a minimum 2" nominal wood furring or an approved design shall be used.

6.7.10.3 Furring shall be spaced not greater than 24" on center in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8" and 12" fastener spacing in furring shall be achieved by use of two fasteners into studs at 16" and 24" o.c., respectively.

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Table 28. Permitted Fastening for Direct Attachment of Cladding Materials through the H-SIS-WAG Exterior Sheathing into the Wood Framing

Cladding Fastener Through 2" H-SIS-WAG Sheathing Into:	Cladding Fastener Type and Min. Size	Cladding Fastener Vertical spacing (in.)	Permitted Fastener Applications									
			16" o.c. Framing					24" o.c. Framing				
			Cladding weight (psf)					Cladding Weight (psf)				
			3	11	15	18	25	3	11	15	18	25
Wood Framing (minimum 1.25" penetration)	0.113" diameter nail	6	OK	-	-	-	-	OK	-	-	-	-
		8	OK	-	-	-	-	OK	-	-	-	-
		12	OK	-	-	-	-		-	-	-	-
	0.120" diameter nail	6	OK	-	-	-	-	OK	-	-	-	-
		8	OK	-	-	-	-	OK	-	-	-	-
		12	OK	-	-	-	-	OK	-	-	-	-
	0.131" diameter nail	6	OK	OK	-	-	-	OK	-	-	-	-
		8	OK	-	-	-	-	OK	-	-	-	-
		12	OK	-	-	-	-	OK	-	-	-	-
	0.162" diameter nail	6	OK	OK	OK	-	-	OK	OK	-	-	-
		8	OK	OK	-	-	-	OK	-	-	-	-
		12	OK	-	-	-	-	OK	-	-	-	-

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

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Table 29. Permitted Fastening for Furring Attachment Through the H-SIS-WAG Exterior Sheathing into Wood Framing

Furring Material	Furring Fastener Through 2" H-SIS-WAG Sheathing Into:	Furring Fastener Diameter and Type	Minimum Penetration into Wall Framing (in.)	Furring Fastener Vertical spacing (in.)	Permitted Fastener Applications									
					16" o.c. Furring					24" o.c. Furring				
					Cladding weight (psf)					Cladding Weight (psf)				
					3	11	15	18	25	3	11	15	18	25
Minimum 1x Wood Furring	Minimum 2x Wood Stud	0.131" diameter nail	1.25	8	OK	OK	-	-	-	OK	-	-	-	-
				12	OK	-	-	-	-	OK	-	-	-	-
				16	OK	-	-	-	-	OK	-	-	-	-
		0.162" diameter nail	1.25	8	OK	OK	OK	-	-	OK	OK	-	-	-
				12	OK	OK	-	-	-	OK	-	-	-	-
				16	OK		-	-	-	OK	-	-	-	-
		No. 10 wood screw	1.00	12	OK	OK	-	-	-	OK	-	-	-	-
				16	OK	-	-	-	-	OK	-	-	-	-
				24	OK	-	-	-	-	OK	-	-	-	-
		1/4" screw	1.50	12	OK	OK	-	-	-	OK	-	-	-	-
				16	OK	-	-	-	-	OK	-	-	-	-
				24	OK	-	-	-	-	OK	-	-	-	-
SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2														

6.8 *H-SIS-WAG Design Properties for Applications that Require Engineered Design*

6.8.1 To design H-SIS-WAG applications where the design requires a shorter span, longer span, a cantilever, a concentrated load, etc., the design properties found in **Table 30** and **Table 31** can be used in standard engineering beam/column equations[23] to obtain H-SIS-WAG resistance to loads.

6.8.2 To properly size H-SIS-WAG beams or columns, treat the H-SIS-WAG member as a 12" panel section as found in **Table 30** and **Table 31**.

6.8.3 Analyze the resistance needed using standard engineering beam/column equations[24] per the member properties defined in **Table 30** and **Table 31**.

6.8.4 To install the sized member as the required assembly for the specific floor, wall, or roof application, it is required to implement all of **Section 6.8**.

6.8.5 For assistance with H-SIS-WAG beam or column specialty engineered designs, please contact HWS Global.

6.8.6 The final application of H-SIS-WAG shall conform to the following requirements:

6.8.6.1 A minimum 2 x 4 No. 2 SPF grade marked lumber is required to be applied at a maximum of 24" o.c.

6.8.6.1.1 Other types, grades, and sizes can be used if their design values are equal to or better than 2 x 4 No. 2 grade SPF.

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6.8.6.2 The exterior sheathing, with the laminate facing the exterior, is fastened to each structural member with #9 x 3" screws at 12" o.c. spacing around the perimeter and 12" o.c. in the field.

6.8.6.3 A $^{3}/_{8}$" bead of proprietary construction adhesive is applied to each structural member along the length of the structural member and top/bottom plates/rim boards.

6.8.6.4 The foam sheathing side (e.g., non-laminate side) is adhered to structural members post glue application.

6.8.6.5 Any unsupported H-SIS-WAG exterior sheathing edges or ends need to be supported by a structural member.

6.8.6.6 All panel edges and ends require the exterior sheathing to be glued and attached to a structural member.

6.8.6.7 Three (3) nails 3" x 0.131" per structural member are required at top/bottom plates when used in walls and for rim board attachment when used in floors or roofs.

6.8.6.8 A minimum $^{1}/_{2}$" GWB is attached to the interior side of the wall to the structural members.

6.8.6.8.1 GWB shall be fastened with #6 x $1^{1}/_{4}$" Type W screws at 16" o.c. spacing around the perimeter and 16" o.c. in the field.

6.8.6.8.2 Any unsupported GWB edges or ends need to be supported by a structural member.

6.8.7 All connections shall be designed separately to transfer load from H-SIS-WAG to other structural members to the foundation.

6.8.7.1 Refer to the manufacturer details and installation instructions.

6.8.8 The allowable design values for H-SIS-WAG used in structural resistance applications[25] are shown in **Table 30** and **Table 31**.

Table 30. H-SIS-WAG Design Properties for Use in Standard Engineering Beam and Column Equations for Wood Framing Members Spaced 16" o.c. (plf)[1,2,3,4,5]

Member Size (12" panel)	F_b (psi)	F_t (psi)	F_v (psi)	$F_{c\parallel}$ (psi)	$F_{c\perp}$ (psi)	Bearing Capacity (lb)	EI (lb-in^2)	MOE (psi)	I_x (in^4)	S_x (in^3)
6" H-SIS-WAG	190	4	18	95	35	1,670	12,800,000	59,000	216	72
8" H-SIS-WAG	155	4	18	110	35	2,630	34,400,000	67,000	512	128
10" H-SIS-WAG	140	4	18	110	35	3,470	72,000,000	78,000	927	190
12" H-SIS-WAG	130	4	18	115	35	4,420	143,800,000	89,000	1,622	276

SI: 1 in = 25.4 mm, 1 ft = 0.305 m, 1 psi = 0.00689 MPa

1. Composite design properties to design a 2" x 6" structural member, when used in the following application examples:
   a. The design of one or more trimmers around a window/door
   b. Design a double member required to carry a concentrated load
   c. Design a cantilevered floor, wall, or roof panel, and so forth.
   See **Section 6.9** through **Section 6.9.5** for the specialty engineered design procedure.
2. F_b includes 1.15 repetitive member factor per NDS requirements.
3. To properly size H-SIS-WAG beams or columns, treat the H-SIS-WAG member as a 12" panel section as found in this table.
4. Analyze the resistance needed using standard engineering beam/column equations per the member properties defined in this table.
5. To install the sized member as the required assembly for any specific floor, wall or roof application, it is required to implement all of **Section 8**.

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Table 31. H-SIS-WAG Design Properties for Use in Standard Engineering Beam and Column Equations for Wood Framing Members Spaced 24" o.c. (plf)[1,2,3,4,5]

Member Size (12" panel)	F_b (psi)	F_t (psi)	F_v (psi)	$F_{c\|\|}$ (psi)	$F_{c\perp}$ (psi)	Bearing Capacity (lb)	EI (lb-in^2)	MOE (psi)	I_x (in^4)	S_x (in^3)
6" H-SIS-WAG	140	4	18	70	35	1,120	9,600,000	44,000	216	72
8" H-SIS-WAG	115	4	18	80	35	1,750	25,800,000	50,000	512	128
10" H-SIS-WAG	105	4	18	85	35	2,310	54,000,000	58,000	927	190
12" H-SIS-WAG	95	4	18	85	35	2,950	107,900,000	67,000	1,622	276

SI: 1 in = 25.4 mm, 1 ft = 0.305 m, 1 psi = 0.00689 MPa

1. Composite design properties to design a 2" x 6" structural member, when used in the following application examples:
   a. The design of one or more trimmers around a window/door
   b. Design a double member required to carry a concentrated load
   c. Design a cantilevered floor, wall or roof panel and so forth.

   See **Section 6.9** through **Section 6.9.5** for the specialty engineered design procedure.
2. F_b includes 1.15 repetitive member factor per NDS requirements.
3. To properly size H-SIS-WAG beams or columns, treat the H-SIS-WAG member as a 12" panel section as found in this table.
4. Analyze the resistance needed using standard engineering beam/column equations per the member properties defined in this table.
5. To install the sized member as the required assembly for any specific floor, wall or roof application, it is required to implement all of **Section 8**.

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6.9 *Design for Compression Loads:*

6.9.1 The maximum allowable compression load for H-SIS-WAG is specified in **Table 17** where H-SIS-WAG assemblies utilizing minimum No. 2 Spruce-Pine-Fir (SPF) structural framing members as wall studs and plates.

6.9.2 The maximum allowable compression load is the lesser of compression perpendicular to grain of the structural members on the bottom plate or panel buckling.

6.9.3 The allowable axial compression for H-SIS-WAG assemblies can be calculated using the provisions of NDS Section 3.6 and NDS Section 3.7.

6.9.3.1 For the H-SIS-WAG panel stability, the values in **Table 30** and **Table 31** can be used to determine the critical buckling design load, P_{cE} (plf). Compute P_{cE} using the formula in **Equation 1**.

Equation 1. Critical Buckling Design Load along HWS SIS Wood panel (plf)

$$P_{cE} = \frac{\pi^2 EI_{min}}{(l_e)^2}$$

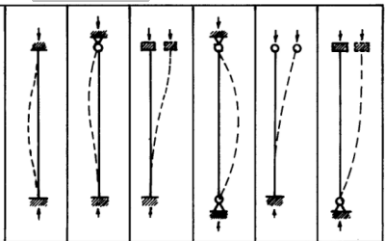
where: EI_{min} = Bending stiffness for H-SIS-WAG panel stability (lb-in^2)

$$EI_{min} = EI * 0.3653$$

l_e = Effective length (in) = K_e x h

h = Panel height (in)

K_e =

Buckling modes						
Theoretical K_e value	0.5	0.7	1.0	1.0	2.0	2.0
Recommended design K_e when ideal conditions approximated	0.65	0.80	1.2	1.0	2.10	2.4
End condition code	Rotation fixed, translation fixed Rotation free, translation fixed Rotation fixed, translation free Rotation free, translation free					

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6.9.4 *Design for Bending:*

6.9.4.1 The maximum bending moment and shear forces shall not exceed the reference design values for the H-SIS-WAG specified in **Table 30** or **Table 31**.

6.9.5 *Design for Combined Bending and Axial Compression Loads:*

6.9.5.1 H-SIS-WAG assemblies resist bending using tension and compression stresses in the wood members.

6.9.5.2 Members subjected to a combination of bending and axial compression shall be proportioned in accordance with **Equation 2**.

Equation 2. Axial Compressive Stress

$$\left[\frac{f_c}{F_c||}\right]^2 + \frac{f_b}{F_b\left[1 - \left(\frac{f_c}{F_{cE}}\right)\right]} \leq 1.0$$

where:

f_c = Applied compression stress to H-SIS-WAG section (psi)

f_b = Applied bending stress to H-SIS-WAG section (psi)

$F_c||$ = Reference compression design value (psi)

F_b = Reference bending design value (psi)

$$f_c < F_{cE} = \frac{0.822 \cdot E_{min}}{(l_e/d)^2}$$

$$E_{min} = MOE \cdot 0.3653$$

d = H-SIS-WAG section depth (in)

l_e = Effective length (in). See **Section 6.9.3.1**

6.10 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 Performance[26]

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.[27]

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.[28]

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8 Installation

8.1 *Installation Procedure to Produce a Complete H-SIS-WAG Component*

8.1.1 The HWS Global internal quality control, installation manual, installation quality control, and third-party quality assurance oversight is currently being performed on a project by project basis.

8.1.2 HWS Global shall provide DrJ the project's quality control, installation manual, installation quality control, and third-party quality assurance oversight for each construction application.

8.1.3 *Exterior Sheathing:*

8.1.3.1 2" XPS foam plastic insulation factory adhered to a proprietary laminate. The laminate faces the exterior and is attached to structural members a maximum of 24" o.c. All panel edges and ends require the exterior sheathing to be glued and fastened to a structural member.

8.1.3.2 *Fastening:*

8.1.3.2.1 The exterior sheathing with the laminate facing the exterior is fastened to wood structural members with #9 x 3" screws at 12" on center spacing around the perimeter and 12" on center in the field.

8.1.3.2.2 A $^{3}/_{8}$" bead of proprietary construction adhesive is applied each structural member, along the length of the structural member, and top/bottom plates/rim boards. The foam sheathing side (e.g., non-laminate side) is adhered to each structural member post adhesive application.

8.1.4 *Structural Member:*

8.1.4.1 A minimum 2 x 4 No. 2 SPF (minimum SG of 0.42) grade marked lumber applied at a maximum of 24" o.c.

8.1.4.1.1 Other lumber types, grades, and sizes can be used if their design values are equal to or better than 2 x 4 No. 2 SPF.

8.1.4.2 *Fastening:*

8.1.4.2.1 Three (3) Nails 3" x 0.131" per structural member are required at top/bottom plates when used in walls and for rim board attachment when used in floors or roofs.

8.1.5 *Cavity Insulation:*

8.1.5.1 When desired, any type of cavity insulation may be used.

8.1.5.2 Fastening is per cavity insulation manufacturer instructions.

8.1.6 *Interior Sheathing:*

8.1.6.1 Minimum $^{1}/_{2}$" GWB attached to structural members.

8.1.6.2 *Fastening:*

8.1.6.2.1 Fastened to each structural member with #6 x $1^{1}/_{4}$" Type W screws at 16" on center spacing around the perimeter and 16" on center in the field. Adhesive can also be applied but is not a requirement.

8.2 *Field Installation of Completed H-SIS-WAG Component*

8.2.1 The HWS Global internal quality control, installation manual, installation quality control, and third-party quality assurance oversight is currently being performed on a project by project basis.

8.2.2 HWS shall provide DrJ the project's quality control, installation manual, installation quality control, and third-party quality assurance oversight for each construction application.

8.3 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.

8.4 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.

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9 Substantiating Data

9.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

9.1.1 Lateral wall testing in accordance with ASTM E564

9.1.2 Cyclic load wall testing in accordance with ASTM E2126

9.1.3 Transverse load testing in accordance with ASTM E330

9.1.4 Basic wind speed calculations in accordance with ASCE/SEI 7 performed by DrJ Engineering

9.1.5 Axial compression calculations in accordance with NDS performed by DrJ Engineering

9.1.6 Axial tension testing in accordance with ASTM E72

9.1.7 Pull-off testing in accordance with ASTM C1860

9.1.8 Axial shear testing for cladding applications in accordance with ASTM E72

9.1.9 Internal bond strength testing of foam plastic insulation sheathing in accordance with ASTM C297

9.1.10 Thermal resistance testing in accordance with ASTM C518

9.1.11 Vapor permeance testing in accordance with ASTM E96

9.1.12 Water resistance testing in accordance with ASTM D779

9.1.13 Surface burning testing in accordance with ASTM E84

9.1.14 Impact resistance testing in accordance with UL 2218

9.2 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.

9.3 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.

9.4 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.

9.5 *Testing and Engineering Analysis*

9.5.1 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.[29]

9.6 Where additional condition of use and/or regulatory compliance information is required, please search for H-SIS-WAG on the DrJ Certification website.

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10 Findings

10.1 As outlined in **Section 6**, H-SIS-WAG has performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.

10.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, H-SIS-WAG shall be approved for the following applications:

10.2.1 Wall bracing as described in **Table 3** through **Table 9**.

10.2.2 Structural performance as described in **Table 10** through **Table 21**.

10.2.3 Thermal performance as described in **Table 22**.

10.2.4 Vapor permeance as described in **Table 23**.

10.2.5 Water resistance as described in **Table 24**.

10.2.6 Surface burning characteristics as described in **Table 25**.

10.2.7 Fire performance as described in **Table 26**.

10.2.8 Impact resistance as described in **Table 27**.

10.2.9 Cladding attachment through 2" H-SIS-WAG Sheathing as described in **Table 28** and **Table 29**.

10.2.10 Design properties as listed in **Table 30** through **Table 31**.

10.3 Unless exempt by state statute, when H-SIS-WAG 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.

10.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from HWS Global

10.5 IBC Section 104.2.3 (IRC Section R104.2.2 and IFC Section 104.2.3[30] are similar) in pertinent part state:

> **104.2.3 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, provided that any such alternative is not specifically prohibited by this code and has been approved.

10.6 **Approved:**[31] Building regulations require that the building official shall accept duly authenticated reports.[32]

10.6.1 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited.

10.6.2 An approved source is *"approved"* when an RDP is properly licensed to transact engineering commerce.

10.6.3 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.

10.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.

10.8 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.[33]

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11 Conditions of Use

11.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

11.2 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.

11.3 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:

11.3.1 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.

11.3.2 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.7.2, IBC Section 110.4, IBC Section 1703, IRC Section R104.7.2, and IRC Section R109.2.

11.3.2.1 The HWS Global internal quality control, installation manual, installation quality control, and third-party quality assurance oversight is currently being performed on a project by project basis.

11.3.2.2 HWS Global shall provide DrJ the project's quality control, installation manual, installation quality control, and third-party quality assurance oversight for each construction application.

11.3.3 This report and the manufacturer installation instructions shall be submitted at the time of permit application.

11.3.4 At a minimum, this innovative product shall be installed per **Section 8**.

11.3.5 The review of this report by the AHJ shall comply with IBC Section 104.2.3.2 and IBC Section 105.3.1.

11.3.6 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.

11.4 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *"the building official shall make, or cause to be made, the necessary tests and investigations; or 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 Section 104.2.3"*, all of IBC Section 104, and IBC Section 105.3.

11.5 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).

11.6 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.

12 Identification

12.1 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.

12.2 Additional technical information can be found at www.hwsglobal.com.

13 Review Schedule

13.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.

13.2 For information on the status of this report, please contact DrJ Certification.

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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 DTSA 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.cbitest.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-mla/#:~: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 2024 version of the codes and the standards referenced therein. This material, product, design, service, and/or method of construction also complies with the 2000-2024 versions of the referenced codes and the standards referenced therein.

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

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

22 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

23 https://www.fao.org/3/i2433e/i2433e04.pdf. For assistance with H-SIS-WAG beam or column specialty engineered designs please contact HWS Global

24 https://www.fao.org/3/i2433e/i2433e04.pdf. For assistance with H-SIS-WAG beam or column specialty engineered designs please contact HWS Global

25 https://www.fao.org/3/i2433e/i2433e04.pdf. For assistance with H-SIS-WAG beam or column specialty engineered designs please contact HWS Global

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

27 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

28 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

29 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

30 2018 IFC Section 104.9

31 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.

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

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

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