

ICC Evaluation Service, Inc.
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Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 06—WOOD AND PLASTICS
Section: 06095—Nails

REPORT HOLDER:

STANLEY FASTENING SYSTEMS, L.L.P.
ROUTE 2, 1 BRIGGS DRIVE
EAST GREENWICH, RHODE ISLAND 02818
(410) 884-2500
www.bostitch.com

EVALUATION SUBJECT:

BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAILS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

The Bostitch Sheather Plus™ (HurriQuake™) nails are used for wood-framed, wood-structural-panel shear walls and diaphragms; for design of engineered wood connections; and for fastening of wood-structural panels used as roof sheathing to wood framing.

3.0 DESCRIPTION

Bostitch Sheather Plus™ (HurriQuake™) nails are 2½ inches (63.5 mm) long, where the top half of the nail length has a smooth shank and the bottom half has a deformed-ring shank. The diameter of the smooth-shank portion of the nails is either 0.113 inch (2.9 mm) or 0.131 inch (3.3 mm), and the outer diameter of the ringed portion is 0.125 inch (3.1 mm) or 0.140 inch (3.5 mm), respectively. The nails have a 0.320-inch-diameter (8.1 mm) head and a tapered tip. Nail tip length is 0.155 inch (3.9 mm) and 0.178 inch (4.5 mm) for the 0.113- and 0.131-inch-diameter (2.9 and 3.3 mm) nails, respectively.

The nails have proprietary head and shank geometries and comply with the material requirements, physical properties, dimensional tolerances, workmanship, protective coating and finishes, and packaging requirements of ASTM F 1667. The nails are manufactured from SAE J403 low-carbon steel wire, grades 1015–1030. When a corrosion-resistant coating is required, the nails can be supplied with a coating of zinc mechanically deposited in accordance with ASTM B 695, Class 55, Type II; or with a coating of zinc electrodeposited in accordance with ASTM A 641, Class 1. Both forms of galvanized nails have a uniform yellow iridescent chromate coating. The minimum average zinc-coating thickness for the

entire nail shank is 0.001 inch (25.4 µm). Nails are manufactured in accordance with approved quality control procedures. Nails are supplied in strips, coils or in bulk.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Nail Bending Yield Strength (F_{yb}): Bostitch Sheather Plus™ (HurriQuake™) nails have a minimum average bending yield strength, F_{yb} , of 100,000 psi (689 MPa).

4.1.2 Lateral Design Values: Lateral (Z) nominal design values for Bostitch Sheather Plus™ (HurriQuake™) nails are shown in Table 1.

4.1.3 Withdrawal Design Values: The withdrawal (W) nominal design values for the 0.113-inch- and 0.131-inch-diameter (2.9 mm and 3.3 mm) Bostitch Sheather Plus™ (HurriQuake™) nails are 50 and 57 pounds per inch (0.17 N/mm), respectively, of penetration into side grain of the main member. These withdrawal nominal design values are valid for lumber having a specific gravity equal to or greater than 0.44.

4.1.4 Diaphragms and Shear Walls: Allowable shear loads for diaphragms and shear walls are as shown in Tables 2 and 3, respectively. Diaphragm and shear wall deflections must be calculated in accordance with Section 2305.2.2 and Section 2305.3.2 of the IBC, respectively, using the nail slip values, e_n , shown in Table 4.

4.1.5 Roof Sheathing—Wind Uplift: Fastening schedules for nails used to fasten wood structural panels used as roof sheathing to wood roof framing members are shown in Table 5 for various roof slopes and basic wind pressures. The fastening schedules are based on the assumptions shown in footnote 1 to Table 5.

4.2 Installation:

The nails must be installed in accordance with the Stanley Fastening Systems published installation instructions and this evaluation report. Nail installation must also comply with applicable requirements in Section 11.1.5 of the NDS. The nails are driven either pneumatically or manually.

5.0 CONDITIONS OF USE

The Bostitch Sheather Plus™ (HurriQuake™) Nails described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** Use of the nails must comply with this report and the applicable code.
- 5.2** Diaphragm and shear wall construction must conform to applicable provisions in the IBC and IRC.
- 5.3** When required by the code official, calculations demonstrating that the applied loads are less than the

design values specified in this report must be submitted for approval. Calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.4 Use of nails in chemically treated wood, such as preservative-treated or fire-retardant-treated wood, is outside the scope of this report.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Nails and Spikes (AC116), dated February 2005.

7.0 IDENTIFICATION

The nails are packaged in cartons bearing labels that provide the manufacturer name (Stanley Fastening Systems/Bostitch); nail description (type, length, and smooth-shank diameter); the minimum specified bending yield strength; and the evaluation report number (ESR-2020). Nongalvanized nails are identified with Stanley Fastening Systems part number RH-S8DR113HP or RH-S8DR131HP; and galvanized nails are identified with Stanley Fastening Systems part number RH-S8R113GHP or RH-S8DR131GHP. Nails recognized for corrosion resistance must be labeled "Electro-galvanized, ASTM A 641" or "Mechanically Galvanized, ASTM B 695."

TABLE 1—LATERAL DESIGN VALUES (Z) FOR SINGLE BOSTITCH® SHEATHER PLUS™/HURRIQUAKE NAILS

NAIL DIAMETER (inch)	SHEATHING PANEL ¹ (SIDE MEMBER)		FRAMING MEMBER (MAIN MEMBER)		
	Type/Grade	Thickness, t_s (inch)	G = 0.55 Southern pine	G = 0.50 Douglas fir–larch	G = 0.42 Spruce-pine-fir
			Nominal Lateral Design Value ^{2,3,4} , Z (pounds)		
0.113	Plywood/Structural I OSB/All Grades	$\frac{3}{8}$	56	54	50
		$\frac{7}{16}$	58	56	52
		$\frac{15}{32}$	60	58	54
	Plywood/Single Floor and Other Grades in DOC PS1 and PS2	$\frac{5}{16}$	48	47	44
		$\frac{3}{8}$	49	48	44
		$\frac{7}{16}$	50	49	46
		$\frac{15}{32}$	51	50	47
		$\frac{19}{32}$	55	54	50
0.131	Plywood/Structural I OSB/All Grades	$\frac{15}{32}$	77	74	69
	Plywood/Single Floor and Other Grades in DOC PS1 and PS2	$\frac{15}{32}$	67	65	61
		$\frac{19}{32}$	70	68	64

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Specific gravity, G, and dowel-bearing strength, F_{es} , for wood structural panels is according to Table 11.3.2B of the NDS.

²Lateral design values are for normal loads and must be multiplied by all applicable adjustment factors.

³Lateral design values based on $F_{yb} = 100,000$ psi (690 N/mm²).

⁴Capacities of other configurations with sawn lumber and engineered wood products with sheathing may be determined with appropriate engineering calculation using NDS, Section 11.

TABLE 2—ALLOWABLE SHEAR (ASD) IN POUNDS PER FOOT FOR WOOD STRUCTURAL PANEL HORIZONTAL DIAPHRAGMS WITH FRAMING OF DOUGLAS FIR–LARCH OR SOUTHERN PINE AND BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAILS FOR WIND AND SEISMIC LOADING^{1,2,3}

SHEATHING PANEL		MINIMUM NOMINAL WIDTH OF FRAMING MEMBER (inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
Type/Grade ⁴	Thickness ⁵ (inch)		Nail spacing (in.) at diaphragm boundaries (all cases) at continuous panel edges parallel to load (Cases 3 and 4), and at all panel edges (Cases 5 and 6) ⁶				Fasteners spaced 6 inches, maximum, at supported edges ⁶	
			6	4	2 ¹ / ₂ ⁽⁷⁾	2 ⁽⁷⁾	Case 1 (No unblocked edges or continuous joints parallel to load)	Cases 2, 3, 4, 5, and 6 (All other configurations)
Nail spacing (inches) at other panel edges (Cases 1, 2, 3, 4) ⁶				6	6	4		
SHEATHER PLUS™ (HURRIQUAKE™) NAIL DIAMETER = 0.113 inch								
Plywood/Structural I OSB/All Grades	3/8	2	205	275	410	465	180	135
		3	230	305	460	520	205	155
	15/32	2	210	280	420	475	185	140
		3	235	315	470	535	210	155
Plywood/Sheathing, Single Floor and Other Grades covered in DOC PS1 and PS2	3/8	2	185	250	375	425	165	125
		3	210	280	420	475	185	140
	7/16	2	195	260	390	440	175	130
		3	220	290	435	490	195	145
	15/32	2	205	275	410	465	180	135
		3	230	305	460	520	205	155
	19/32	2	210	280	420	475	185	140
		3	235	315	470	535	210	155
SHEATHER PLUS™ (HURRIQUAKE™) NAIL DIAMETER = 0.131 inch								
Plywood/Structural I OSB/All Grades	15/32	2	270	360	540	610	240	180
		3	305	405	605	685	270	200
Plywood/Sheathing, Single Floor and Other Grades covered in DOC PS1 and PS2	15/32	2	265	355	535	605	235	180
		3	300	400	600	680	265	200
	19/32	2	270	360	540	610	240	180
		3	305	405	605	685	270	200

For **SI**: 1 inch = 25.4 mm, 1 pound per foot = 0.0146 N/mm.

¹The tabulated values are for short-time loads due to wind or earthquake and must be reduced by 25 percent for normal loading based on a duration of load factor of 1.33 and a diaphragm factor of 1.4.

²In addition to the requirements presented for fastening of horizontal diaphragms, all other requirements for the design and construction of wood diaphragms must be in accordance with Section 2305.2 of the IBC.

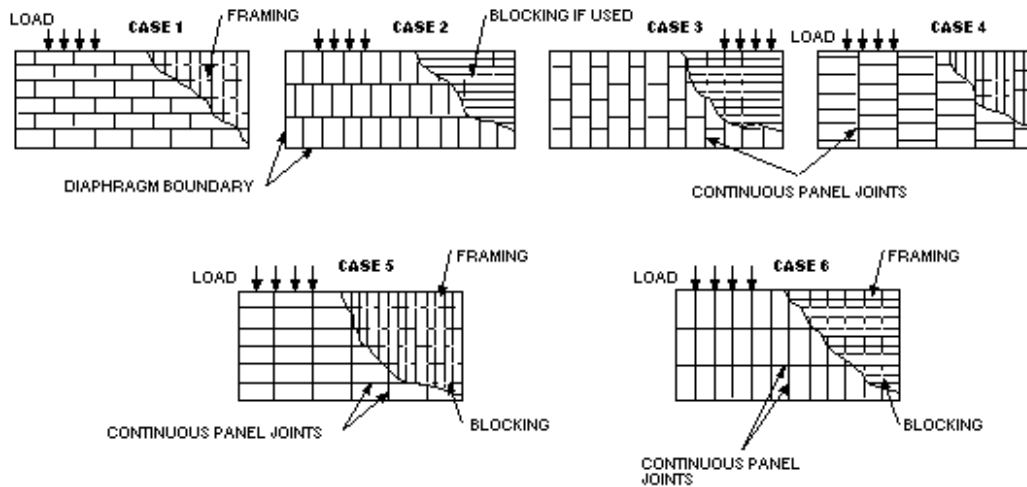
³The tabulated values are for nails installed in Douglas fir–larch or southern pine framing members. When the wood framing members have a specific gravity equal to or greater than 0.42 but less than 0.50, the allowable shear value for the diaphragm must be calculated by multiplying the tabulated value by 0.82. For wood framing members with specific gravity less than 0.42, the tabulated values must be multiplied by 0.65.

⁴C-D and C-C plywood exterior sheathing is covered in PS1. Grades of wood-based structural panels designed and manufactured for sheathing, structural I sheathing, and single floor applications are covered in PS2.

⁵Plywood not exceeding 1¹/₈ inches thick is permitted to be fastened to the supporting framing members provided the fastener penetration is at least 11 diameters (smooth-shank diameter).

⁶Values are based on 24-inch on-center spacing of support framing members. Fasteners must be spaced a maximum of 12 inches o.c. along intermediate framing members (6 inches o.c. when supports are spaced 48 inches o.c.).

⁷Framing at adjoining panel edges must be a nominal 3 inches or wider, and nails must be staggered where nails are spaced 2 inches o.c. or 2¹/₂ inches o.c.



NOTE: Framing may be oriented in either direction for diaphragms, provided sheathing is properly designed for vertical loading.

TABLE 3—ALLOWABLE SHEAR (ASD) IN POUNDS PER FOOT FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH DOUGLAS FIR–LARCH OR SOUTHERN PINE FRAMING AND BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAILS FOR WIND OR SEISMIC LOADING^{1,2,3}

SHEATHING PANEL		FRAMING SPACING (inches o.c.)	NAIL SPACING AT PANEL EDGES WITH PANELS APPLIED DIRECTLY TO FRAMING MEMBERS ^{4,5,6} (inches)			
Type/Grade	Thickness (inch)		6	4	3	2 ⁷
SHEATHER PLUS™ (HURRIQUAKE™) NAIL DIAMETER = 0.113 inch						
Plywood/Structural I OSB/All Grades	3/8	24	180	270	365	465
		16	215	325	445	560
	7/16	24	200	300	400	510
		16	220	325	435	555
Rated Wood-based Panel Sheathing and Plywood Siding ⁸	5/16	24	180	270	350	450
		16	215	325	420	540
	3/8	24	165	245	325	415
		16	200	295	390	500
	7/16	24	180	270	360	460
		16	195	295	395	500
	15/32	16 or 24	195	295	390	500
	19/32	16 or 24	225	335	445	570
SHEATHER PLUS™ (HURRIQUAKE™) NAIL DIAMETER = 0.131 inch						
Plywood/Structural I OSB/All Grades	15/32	16 or 24	285	425	570	725
Rated Wood-based Panel Sheathing and Plywood Siding ⁸	15/32	16 or 24	255	385	510	650
	19/32	16 or 24	285	430	575	730

For **SI**: 1 inch = 25.4 mm, 1 lb/ft = 0.0146 N/mm.

¹Tabulated values are for short-duration loads due to wind and earthquake and must be reduced by 25 percent for normal loading based on a duration of load factor of 1.33.

²Allowable shear values for nails in framing members of other species must be calculated for all other species by multiplying the shear capacities from the table above for nails and actual panel grade by the following adjustment factor: $F_{SG} = [1 - (0.50 - SG)] \leq 1.0$, where F_{SG} = Specific Gravity Adjustment Factor, and SG = Specific Gravity of the substitute framing lumber.

³Sheathing panels are applied directly to framing. All panel edges shall be backed with nominally 2-inch or wider framing. Panels are permitted to be installed either horizontally or vertically. Nails shall be spaced 6 inches on center along intermediate framing members for 3/8-inch- and 7/16-inch-thick panels installed on studs spaced 24 inches on center. For other conditions and panel thicknesses, nails shall be spaced a maximum 12 inches on center on intermediate members.

⁴Minimum penetration in framing shall be 0.90 inch when D = 0.113 inch; minimum penetration shall be 1.05 inch when D = 0.131 inch.

⁵In Seismic Design Categories D, E or F, and where allowable shear values exceed 350 plf (ASD), all framing members receiving edge nailing from abutting panels and foundation sill plates must not be less than a single nominally 3-inch member. Nailing at wood structural panel joints and at sill plates must be staggered in all cases.

⁶Where panels are applied on both faces of a wall and nail spacing is less than 6 inches on center on either side, panel joints must be offset to fall on different framing members or framing must be a nominal 3 inches or thicker and nails on each side must be staggered.

⁷Framing at adjoining panel edges must be nominal 3 inches or wider, and nails must be staggered where nails are spaced 2 inches o.c.

⁸Sheathing may be either OSB or plywood but siding values apply only to all veneer plywood rated siding. Thickness at point of nailing on panel edges must govern shear values.

TABLE 4—NAIL SLIP, e_n , VALUES FOR BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAILS
(For Use in Calculating Shear Wall and Diaphragm Deflection Due to Nail Slip)¹

BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAIL DIAMETER (inch)	LOAD PER NAIL (pounds)								
	60	80	100	120	140	160	180	200	220
	NAIL SLIP, e_n (inches)								
0.113	0.012	0.200	0.030	0.045	0.068	0.102	—	—	—
0.131	0.008	0.012	0.018	0.023	0.031	0.041	0.056	0.074	0.096

For SI: 1 inch = 25.4 mm, 1 pound = 4.45 N.

¹Tabulated e_n values are based on Structural I wood structural panels fastened to lumber with a specific gravity of 0.50 or greater. The values are permitted to be increased by 20 percent for panel grades other than Structural I.

²Load per nail is determined by dividing the maximum shear load (pounds per linear foot) by the number of nails per foot at interior panel edges.

³The e_n values must be decreased by 50 percent for seasoned lumber.

TABLE 5—NAIL SPACING SCHEDULE (inches o.c.) FOR WIND UPLIFT OF WOOD STRUCTURAL PANELS USED AS ROOF SHEATHING SUPPORTED BY DOUGLAS FIR–LARCH OR SOUTHERN PINE ROOF FRAMING MEMBERS¹

ROOF SLOPE (degrees)	ROOF RISE (inches) (per 12-inch run)	ROOF ZONE ²	NAIL LOCATION	BASIC WIND SPEED (BWS) (3-Second Gust, mph)							
				80<BWS<100		101<BWS<130		131<BWS<150		BWS≤170	
				Exposure Category							
				B	C	B	C	B	C	B	C
0.113-INCH-DIAMETER BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAIL											
0 to 10	2	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	8	8	6	8	4
		3	Panel edges	6	6	6	6	6	6	4	6
			Panel field	12	8	8	6	6	4	6	4
10+ to 30	2+ to 7	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	12	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	8	8	8	4	6	4
		3	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	8	6	8	4	6	4
30+ to 45	7+ to 12	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	8	6
		3	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	8	6
0.131-INCH-DIAMETER BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAIL											
0 to 10	2	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	12	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	8	8	6	8	4
		3	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	8	6	8	4	6	4
10+ to 30	2+ to 7	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	12	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	8	8	6	8	4
		3	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	8	8	6	8	4

(Continued)

TABLE 5—NAIL SPACING SCHEDULE (inches o.c.) FOR WIND UPLIFT OF WOOD STRUCTURAL PANELS USED AS ROOF SHEATHING SUPPORTED BY DOUGLAS FIR–LARCH OR SOUTHERN PINE ROOF FRAMING MEMBERS¹ (Continued)

ROOF SLOPE (degrees)	ROOF RISE (inches) (per 12-inch run)	ROOF ZONE ²	NAIL LOCATION	BASIC WIND SPEED (BWS) (3-Second Gust, mph)							
				80<BWS<100		101<BWS<130		131<BWS<150		BWS≤170	
				Exposure Category							
				B	C	B	C	B	C	B	C
0.131-INCH-DIAMETER BOSTITCH SHEATHER PLUS™ (HURRIQUAKE™) NAIL (continued)											
30+ to 45	7+ to 12	1	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	12	12	8
		2	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	12	8
		3	Panel edges	6	6	6	6	6	6	6	6
			Panel field	12	12	12	12	12	8	12	8

For SI: 1 mph = 1.61 km/h, 1 inch = 25.4 mm.

¹Nailing schedules are calculated based on the following assumptions:

- a. Mean roof height is 30 feet (9144 mm).
- b. Exposure categories B and C are defined in Section 1609.4 of the IBC.
- c. Net design wind uplift pressure (component and cladding), p_{net} , is based on Equation 16-35 of the IBC, where the adjustment factor, λ , equals 1.4 (adjusting for Exposure B to Exposure C); the importance factor, I_w , equals 1.0; and p_{net30} complies with Table 1609.6.2.1(2) of the IBC or Table R301.2(2) of the IRC; and the effective wind area is 10 ft² (0.929 m²).
- d. Roof framing members have a minimum nominal width of 2 inches (50.8 mm), and are spaced a maximum of 24 inches (610 mm) on center.
- e. Roof framing members have a minimum specific gravity, G, of 0.44.
- f. Wood structural panels used as roof sheathing have a maximum thickness of 1/2 inch (12.7 mm), and are oriented with the strength axis perpendicular to the roof framing members. The panel edges are blocked.
- g. Minimum penetration, p , of the Bostitch Sheather Plus™ (HurriQuake™) nails into roof framing members is 2 inches (50.8 mm)

²Refer to Figure 1 for roof fastening zones.

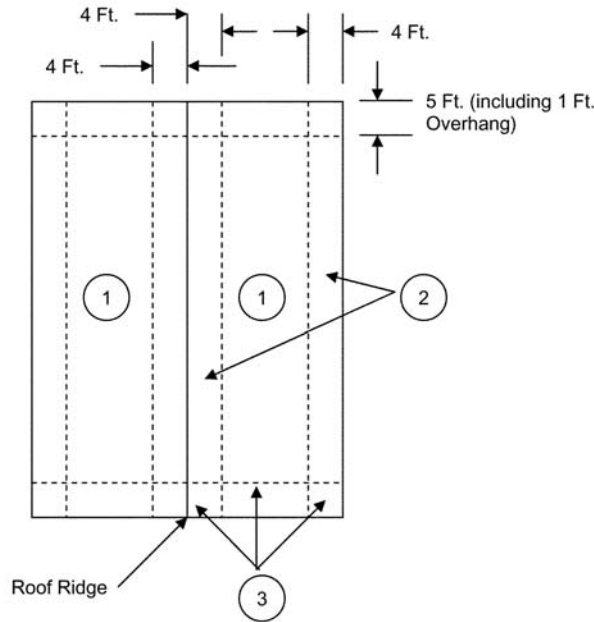


FIGURE 1—ROOF ZONES REFERENCED IN TABLE 5