



ICC Evaluation Service, Inc.
www.icc-es.org

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

Legacy report on the 1997 Uniform Building Code™

DIVISION: 06—WOOD AND PLASTICS
Section: 06090—Wood and Plastic Fastenings

ET & F PNEUMATIC FASTENERS

ET & F FASTENING SYSTEMS, INC.
29019 SOLON ROAD
SOLON, OHIO 44139

1.0 SUBJECT

ET & F Pneumatic Fasteners.

2.0 DESCRIPTION

2.1 General:

This evaluation report recognizes horizontal diaphragms and shear walls consisting of plywood attached to steel framing with ET & F pneumatic fasteners. The fasteners are also recognized for the attachment of wood and plywood to steel framing members. The fasteners are manufactured from AISI 1060 or AISI 1566 steel that is heat treated to a hardness Rc of 52 to 54. The fasteners have a smooth, knurled or step-down shank and are either electrozinc plated with a chromate finish, mechanical zinc-plated, or coated with an Aerico™ polymer finish. They are produced with part numbers 190, 144, and 100 [0.190-inch, 0.140-inch and 0.100-inch (4.83, 3.55, and 2.54 mm) diameters] which have 3/8-inch-, 5/16-inch- and 1/4-inch-diameter (9.5, 7.9 and 6.4 mm) heads. The 0.100-inch-diameter (2.54 mm) fasteners are produced with either a 5/16-inch (7.9 mm) head (designation AGS) or 1/4-inch (6.4 mm) head (designation AKN). Steel framing members noted as gages in this report refer to the following base metal thicknesses:

- No. 14 gage: 0.071 inch (1.80 mm)
No. 16 gage: 0.0553 inch (1.40 mm)
No. 18 gage: 0.0428 inch (1.09 mm)
No. 20 gage: 0.0333 inch (0.84 mm)
No. 22 gage: 0.0275 inch (0.70 mm)

2.2 Plywood Deck Diaphragms:

ET & F pneumatic fasteners are permitted to be used to fasten code-complying plywood decks to steel framing members. Allowable shear for plywood diaphragms attached with the 0.144-inch-diameter (3.66 mm) fasteners is shown in Table 1. Allowable shear for plywood diaphragms attached with 0.100-inch-diameter (2.54 mm) fasteners is indicated in Tables 12 and 13. Panels noted in Tables 1, 12 and 13 must

be capable of supporting vertical loads based on the panel span ratings indicated in Table 23-II-E-1 of the 1997 Uniform Building Code™ (UBC). If diaphragm blocking is required, it must be provided as indicated in the code. The maximum diaphragm span-to-width ratio is 4:1.

Diaphragm deflections must be computed using the equation in Section 23.222 of UBC Standard 23-2. For determination of en in that equation, see Table 14.

2.3 Plywood Deck Horizontal Diaphragms with Steel Ledgers and Wood Framing:

For horizontal diaphragms consisting of plywood panels, wood framing and steel diaphragm boundary members, the ET & F minimum 0.144-inch-diameter fasteners, described in Section 2.1, are permitted to be used to fasten the plywood to the steel ledgers and other steel roof members of the diaphragm. The plywood shall have a minimum thickness of 15/32 inch (11.9 mm) and be attached to the wood framing members with 10d common nails. The steel members must be minimum No. 14 gage [0.071 inch (1.80 mm) base-metal thickness] steel.

The diaphragm design, including fastener spacing and diaphragm capacity, shall be based on UBC Table 23-II-H but with the ET & F fasteners attaching the plywood to the steel members substituted at diaphragm perimeters for the 10d common nails. Where required, diaphragm blocking must be provided as indicated in the code. The maximum diaphragm span-to-width ratio is 4:1.

Diaphragm deflection must be computed by using the equation in Section 23.222 of UBC Standard 23-2 and a nail slip factor (en) of 0.034 for the 10d common nails and ET & F fasteners.

2.4 Plywood Shear Walls:

ET & F fasteners are permitted to be used to fasten plywood panels to steel framing members. The allowable shear and pertinent construction requirements are indicated in Table 2 and Tables 8 through 11. The maximum shear wall height-to-width ratio is 3 1/2:1 for Seismic Zones 0, 1, 2 and 3, and 2:1 for Seismic Zone 4. Shear wall deflections must be computed using the equation in Section 23.223 of UBC Standard 23-2. For determination of en in that equation, see Table 14.

2.5 Wood and Plywood Attached to Steel: ET & F fasteners are also permitted to be used to fasten wood and plywood to steel framing members. Fastener information, attachment dimensions, required penetrations, and allowable loads are set forth in Tables 3 through 7.

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2.6 Identification:

The fasteners are identified by the ET & F Fastening Systems, Inc., name, evaluation report number (ER-4144), lot number and catalog number on the cartons, and the following symbol on the head of each fastener:



3.0 EVIDENCE SUBMITTED

Reports of full-scale horizontal diaphragm and shear wall load tests, small-scale fastener tests, descriptive details, structural calculations and a quality control manual.

4.0 FINDINGS

That the ET & F Pneumatic Fasteners described in this report comply with the 1997 *Uniform Building Code*TM, subject to the following conditions:

- 4.1 The allowable shear values for the plywood horizontal diaphragms and plywood shear walls noted in Tables 1, 2, and 8 through 13 exceed the design loads.
- 4.2 Individual fastener attachment allowable values set forth in Tables 3 through 7 exceed the design loads.
- 4.3 Limitations based on deflections of horizontal diaphragms and shear walls must be considered in design.
- 4.4 Shear walls are limited to use to resist wind forces.

This report is subject to re-examination in one year.

TABLE 1—ALLOWABLE SHEAR VALUES IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS WITH STEEL FRAMING AND ET&F 0.144 INCH-DIAMETER FASTENERS^{1,2,7,8}

PANEL	MINIMUM PANEL THICKNESS (inches)	FRAMING WIDTH ³ (inches)	BLOCKED DIAPHRAGMS—FASTENERS SPACING ⁵				UNBLOCKED DIAPHRAGMS ^{5,6}	
			6	4	2 ¹ / ₂	2	Case 1	Case 2-6
			6	6	4	3		
STRUCTURAL I	3/8	1 ¹ / ₂	315	420	630	840	280	210
		2 ¹ / ₂	355	470	710	945	315	235
	15/32	1 ¹ / ₂	395	525	790	1,055	350	265
		2 ¹ / ₂	445	590	890	1,185	395	295
SHEATHING, other grades covered in DOC PS 1 or DOC PS 2	3/8	1 ¹ / ₂	285	380	565	755	250	190
		2 ¹ / ₂	320	425	635	845	285	210
	15/32	1 ¹ / ₂	355	475	710	905	315	235
		2 ¹ / ₂	400	535	800	905	355	265
	19/32	1 ¹ / ₂	385	515	775	970	345	260
		2 ¹ / ₂	435	580	870	970	385	290
	23/32	1 ¹ / ₂	385	515	775	1,030	345	260
		2 ¹ / ₂	435	580	870	1,160	385	290
23/32 ⁴	1 ¹ / ₂	400	530	800	1,065	355	265	
	2 ¹ / ₂	450	600	895	1,195	400	300	

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹These values are for short-time loads due to wind or earthquake and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the thickness of the support a minimum of 1/4 inch.

³All framing is minimum No. 14 gage steel, except as noted in Footnote 4.

⁴These values are for diaphragms with minimum No. 11 gage framing.

⁵For fastener spacing and case description see UBC Table 23-II-H.

⁶Maximum fastener spacing at 6 inches on center.

⁷Spacing of fasteners along intermediate framing members is 12 inches on center for spans less than 48 inches, and 6 inches on center for spans 48 inches and greater.

⁸The minimum panel edge distance is 3/8 inch.

TABLE 2—ALLOWABLE SHEAR VALUES FOR WIND FORCES IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS WITH STEEL FRAMING AND ET&F 0.144-INCH-DIAMETER FASTENERS^{1,2,3,4,5}

PANEL	MINIMUM PANEL THICKNESS (inches)	FRAMING SPACING (inches on center)	FASTENER SPACING (inches on center)			
			6	4	3	2
APA STRUCTURAL I	³ / ₈ ⁶	24	230	345	460	585
	³ / ₈	16	280	420	560	715
	⁷ / ₁₆	24	300	445	595	760
	⁷ / ₁₆	16	330	490	655	835
	¹⁵ / ₃₂	16 or 24	350	525	705	895
	¹ / ₂	16 or 24	375	560	745	950
APA-RATED SHEATHING AND SIDING	³ / ₈ ⁶	24	205	310	415	525
	³ / ₈	16	250	380	505	645
	⁷ / ₁₆	24	270	400	535	685
	⁷ / ₁₆	16	295	440	590	750
	¹⁵ / ₃₂	16 or 24	315	475	630	805
	¹ / ₂	16 or 24	335	505	670	855
¹⁹ / ₃₂	16 or 24	345	515	690	875	

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹These values are for short-time loads due to wind and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the thickness of the support a minimum of ¹/₄ inch.

³Steel framing must be minimum No. 14 gage with minimum flange width of ¹/₂ inches.

⁴Spacing of fasteners along intermediate framing members is 12 inches on center.

⁵The minimum panel edge distance is ³/₈ inch.

⁶Spacing of these fasteners along intermediate framing members is 6 inches on center.

TABLE 3—ALLOWABLE LATERAL VALUES IN POUNDS PER FASTENER DUE TO WIND OR SEISMIC LOADS FOR WOOD¹ OR PLYWOOD SHEATHING^{2,4} ATTACHED TO STEEL FRAMING WITH ET&F FASTENERS³

CATALOG NUMBER	SHANK TYPE	SHANK DIAMETER	MINIMUM STEEL THICKNESS	MINIMUM THICKNESS OF LUMBER AND/OR STRUCTURAL PANELS						
				³ / ₈ "	⁷ / ₁₆ "	¹⁵ / ₃₂ "	¹⁹ / ₃₂ "	²³ / ₃₂ "	1"	¹¹ / ₈ "
AKN	Knurled	0.144	14 gage	155	185	195	215	215	215	215
ASM	Smooth	.0144	11 gage	155	185	195	215	220	220	220
ASM	Smooth	0.144	³ / ₁₆ "	155	185	195	215	220	240	240
ASM	Smooth	0.144	¹ / ₄ "	155	185	195	215	220	245	245
ASD	Step Down	0.190	³ / ₁₆ "	—	—	260	330	375	390	390

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Wood must have specific gravity of 0.51 or greater.

²Plywood sheathing must be Structural I-rated sheathing; for plywood sheathing other than Structural 1, covered in DOC PS 1 or DOC PS 2, values must be reduced 10 percent.

³These values are for loads due to wind or earthquake and must be reduced by 25 percent for other applications.

⁴Minimum panel edge distance is ³/₈ inch.

TABLE 4—ALLOWABLE LATERAL VALUES IN POUNDS PER FASTENER DUE TO WIND OR SEISMIC LOADS FOR WOOD¹ OR PLYWOOD SHEATHING^{2,4} ATTACHED TO STEEL FRAMING WITH ET&F FASTENERS³

CATALOG NUMBER	SHANK TYPE	SHANK DIAMETER	MINIMUM STEEL THICKNESS	MINIMUM THICKNESS OF LUMBER AND/OR STRUCTURAL PANELS						
				³ / ₈ "	⁷ / ₁₆ "	¹⁵ / ₃₂ "	¹⁹ / ₃₂ "	²³ / ₃₂ "	1"	¹¹ / ₈ "
AKN	Knurled	0.144	14 gage	110	130	135	175	185	185	185
ASM	Smooth	0.144	11 gage	110	130	135	175	185	190	190
ASM	Smooth	0.144	³ / ₁₆ "	110	130	135	175	185	190	195
ASD	Step Down	0.190	³ / ₁₆ "	—	—	180	230	280	320	320

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

¹Values in this table are limited to lumber with specific gravity in the range of 0.42 and 0.50.

²Plywood sheathing must be Structural I-sheathing; for plywood sheathing other than Structural 1, covered in DOC PS 1 or DOC PS 2, values must be reduced 10 percent.

³These values are for loads due to wind or earthquake and must be reduced by 25 percent for other applications.

⁴Minimum panel edge distance is ³/₈ inch.

TABLE 5—ALLOWABLE WITHDRAWAL VALUES IN POUNDS PER FASTENER DUE TO WIND OR SEISMIC LOADS¹

CATALOG NUMBER	SHANK TYPE	SHANK DIAMETER	MINIMUM STEEL THICKNESS	MINIMUM THICKNESS OF LUMBER ⁶ AND/OR STRUCTURAL PANELS ^{2,7}								
				$\frac{3}{8}$ "	$\frac{7}{16}$ "	$\frac{15}{32}$ "	$\frac{19}{32}$ "	$\frac{23}{32}$ "	$1\frac{1}{8}$ "	$1\frac{1}{2}$ "	$\frac{23}{32}$ " + 2 x 4	$1\frac{1}{8}$ " + 2 x 4
AKN	Knurled	0.144 ³	14 gage	55	85	90	95	100	120	—	—	—
ASM	Smooth	0.144 ³	11 gage	55	85	90	95	100	120	—	—	—
ASD	Step Down	0.190 ⁴	14 gage	—	—	—	—	—	140	140	140	140
ASD	Step Down	0.190 ⁴	11 gage	—	—	—	—	—	195	195	195	195
ASD	Step Down	0.190 ⁵	$\frac{3}{16}$ "	—	—	—	—	—	230	250	285	310

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

¹These values are for loads due to wind or earthquake and must be reduced by 25 percent for other applications.

²Values are for Structural I panels; for plywood sheathing other than Structural 1, covered in DOC PS 1 or DOC PS 2, reduce loads 10 percent.

³Fastener loads are governed by the lumber and/or panel thickness.

⁴Fastener loads are governed by the metal framing thickness.

⁵Fastener loads are governed by the lumber and/or panel thickness.

⁶Specific gravity of lumber must be greater than 0.51.

⁷Minimum panel edge distance is $\frac{3}{8}$ inch.

TABLE 6—ALLOWABLE WITHDRAWAL VALUES FOR STRUCTURAL I PLYWOOD ATTACHED TO STEEL FRAMING IN POUNDS PER FASTENER DUE TO WIND OR SEISMIC LOADS^{1,2,3}

FASTENER			MINIMUM STEEL FRAMING THICKNESS	MINIMUM THICKNESS OF STRUCTURAL PANEL (inches)		
Catalogue Number	Shank Type	Shank Diameter (inches)		$\frac{3}{8}$	$\frac{7}{16}$	$\frac{15}{32}$
AKN or AGS	Knurled	0.100	16 ga	70	90	95
			18 ga	65	65	65
			20 ga	35	35	35
			22 ga	20	20	20

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

¹Values are for loads imposed by wind or earthquake and must be reduced by 25 percent for normal loading.

²For rated sheathing panels, loads must be reduced by 10 percent.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

TABLE 7—ALLOWABLE LATERAL VALUES IN POUNDS PER FASTENER FOR STRUCTURAL I PLYWOOD ATTACHED TO STEEL FRAMING^{1,2,3}

FASTENER			MINIMUM STEEL FRAMING THICKNESS	MINIMUM THICKNESS OF STRUCTURAL PANELS (inch)				
Catalogue Number	Type	Shank Diameter (inches)		$\frac{3}{8}$	$\frac{7}{16}$	$\frac{15}{32}$	$\frac{1}{2}$	$\frac{19}{32}$
AKN or AGS	Knurled	0.100	16 ga	110	130	135	145	165
			18 ga	110	130	135	135	135
			20 ga	100	100	100	100	100
			22 ga	85	85	85	85	85

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

¹Values must be reduced 10 percent for rated sheathing.

²Values are for loads imposed by wind or earthquake and must be reduced by 25 percent for normal loading.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

TABLE 8—ALLOWABLE SHEAR VALUES FOR WIND FORCES IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS WITH MINIMUM NO. 16 GAGE STEEL FRAMING AND ET&F AKN OR ANS 0.100-INCH-DIAMETER FASTENERS^{1,2,3,4}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING SPACING (inches on center)	FASTENER SPACING (inches on center)			
			6	4	3	2
STRUCTURAL I	$\frac{3}{8}$ ⁵	24	160	240	320	405
	$\frac{3}{8}$	16	195	290	390	495
	$\frac{7}{16}$ ⁵	24	205	310	415	530
	$\frac{7}{16}$	16	230	340	455	580
	$\frac{15}{32}$	16 or 24	240	365	485	615
	$\frac{1}{2}$	16 or 24	260	390	515	660
	RATED SHEATHING AND SIDING	$\frac{3}{8}$ ⁵	24	145	215	285
$\frac{3}{8}$		16	175	265	350	445
$\frac{7}{16}$ ⁵		24	185	280	375	475
$\frac{7}{16}$		16	205	310	410	525
$\frac{15}{32}$		16 or 24	220	325	435	555
$\frac{1}{2}$		16 or 24	235	350	465	595
$\frac{19}{32}$		16 or 24	265	400	535	680

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for loads imposed by wind and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the metal framing a minimum of $\frac{1}{4}$ inch.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

⁴Spacing of fasteners along intermediate framing members is 12 inches on center except as noted.

⁵Spacing of fasteners along intermediate framing members is 6 inches on center.

TABLE 9—ALLOWABLE SHEAR VALUES FOR WIND FORCES IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS WITH MINIMUM NO. 18 GAGE STEEL FRAMING AND ET&F AKN OR AGS 0.100-INCH-DIAMETER FASTENERS^{1,2,3,4}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING SPACING (inches on center)	FASTENER SPACING (inches on center)			
			6	4	3	2
STRUCTURAL I	$\frac{3}{8}$ ⁵	24	160	240	320	405
	$\frac{3}{8}$	16	195	290	390	495
	$\frac{7}{16}$ ⁵	24	205	310	415	530
	$\frac{7}{16}$	16	230	340	455	580
	$\frac{15}{32}$	16 or 24	235	355	475	605
RATED SHEATHING AND SIDING	$\frac{3}{8}$ ⁵	24	145	215	285	365
	$\frac{3}{8}$	16	175	265	350	445
	$\frac{7}{16}$ ⁵	24	185	280	375	475
	$\frac{7}{16}$	16	205	310	410	525
	$\frac{15}{32}$	16 or 24	215	320	425	545

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for loads imposed by wind and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the metal framing a minimum of $\frac{1}{4}$ inch.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

⁴Spacing of fasteners along intermediate framing members is 12 inches on center except as noted.

⁵Spacing of fasteners along intermediate framing members is 6 inches on center.

TABLE 10—ALLOWABLE SHEAR VALUES FOR WIND FORCES IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS WITH MINIMUM NO. 20 GAGE STEEL FRAMING AND ET&F AKN OR AGS 0.100-INCH-DIAMETER FASTENERS^{1,2,3,4}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING SPACING (inches on center)	FASTENER SPACING (inches on center)			
			6	4	3	2
STRUCTURAL I	$\frac{3}{8}$ ⁵	24	145	220	290	370
	$\frac{3}{8}$	16	180	265	355	455
	$\frac{7}{16}$ ⁵	24	160	245	325	415
	$\frac{7}{16}$	16	180	265	355	455
RATED SHEATHING AND SIDING	$\frac{3}{8}$ ⁵	24	130	195	265	335
	$\frac{3}{8}$	16	160	240	320	410
	$\frac{7}{16}$ ⁵	24	145	220	290	370
	$\frac{7}{16}$	16	160	240	320	410

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for loads imposed by wind and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the metal framing a minimum of $\frac{1}{4}$ inch.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

⁴Spacing of fasteners along intermediate framing members is 12 inches on center except as noted.

⁵Spacing of fasteners along intermediate framing members is 6 inches on center.

TABLE 11—ALLOWABLE SHEAR VALUES FOR WIND FORCES IN POUNDS PER FOOT FOR PLYWOOD SHEAR WALLS WITH MINIMUM NO. 22 GAGE STEEL FRAMING AND ET&F AKN OR AGS 0.100-INCH-DIAMETER FASTENERS^{1,2,3,4}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING SPACING (inches on center)	FASTENER SPACING (inches on center)			
			6	4	3	2
STRUCTURAL I	$\frac{3}{8}$ ⁵	24	125	185	245	315
	$\frac{3}{8}$	16	150	225	300	380
	$\frac{7}{16}$ ⁵	24	135	205	270	345
	$\frac{7}{16}$	16	150	225	300	380
RATED SHEATHING AND SIDING	$\frac{3}{8}$ ⁵	24	110	165	220	280
	$\frac{3}{8}$	16	135	200	270	345
	$\frac{7}{16}$ ⁵	24	120	185	245	310
	$\frac{7}{16}$	16	135	200	270	345

For **SI**: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for loads imposed by wind and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the metal framing a minimum of $\frac{1}{4}$ inch.

³The minimum panel edge distance is $\frac{3}{8}$ inch.

⁴Spacing of fasteners along intermediate framing members is 12 inches on center except as noted.

⁵Spacing of fasteners along intermediate framing members is 6 inches on center.

TABLE 12—ALLOWABLE SHEAR VALUES IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS WITH NO. 16 GAGE OR NO. 18 GAGE STEEL FRAMING AND ET&F AKN OR AGS 0.100-INCH-DIAMETER FASTENERS^{1,2,3}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING WIDTH (inches)	BLOCKED DIAPHRAGMS FASTENER SPACING ^{4,5}				UNBLOCKED DIAPHRAGMS ^{4,5}	
			6	4	2 ^{1/2}	2	Case 1	Case 2-6
			6	6	4	3		
STRUCTURAL I	3/8	1 1/2	220	290	440	585	195	145
		2 1/2	245	330	490	655	220	165
	7/16	1 1/2	255	340	515	685	230	170
		2 1/2	290	385	575	770	255	190
	15/32	1 1/2	265	355	535	710	235	180
2 1/2		300	400	600	800	265	200	
SHEATHING, other grades covered in DOC PS 1 or DOC PS 2	3/8	1 1/2	195	265	395	525	175	130
		2 1/2	220	295	445	590	195	150
	7/16	1 1/2	230	310	460	615	205	155
		2 1/2	260	345	520	690	230	175
	15/32	1 1/2	240	320	480	640	215	160
2 1/2		270	360	540	720	240	180	
15/32 ⁶	1 1/2	245	325	490	655	220	165	
	2 1/2	275	365	550	735	245	185	
19/32 ⁶	1 1/2	300	400	600	800	265	200	
	2 1/2	340	450	675	900	300	225	

For SI: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for loads imposed by wind or earthquake and must be reduced 25 percent for normal loading.

²The pin must be long enough to penetrate through the metal framing a minimum of 1/4 inch.

³The minimum panel edge distance is 3/8 inch.

⁴For fastener spacing and case description see UBC Table 23-II-H.

⁵Spacing of fasteners along intermediate framing members is 12 inches on center.

⁶To obtain the allowable shear values for these thicknesses requires a minimum No. 16 gage framing member.

TABLE 13—ALLOWABLE SHEAR VALUES IN POUNDS PER FOOT FOR HORIZONTAL PLYWOOD DIAPHRAGMS WITH MINIMUM NO. 22 OR 22 GAGE STEEL FRAMING AND ET & F AKN OR AGS 0.100-INCH-DIAMETER PINS^{1,2,3,6}

PANEL	MINIMUM PANEL THICKNESS (inch)	FRAMING		BLOCKED DIAPHRAGM FASTENER SPACING ^{4,5}				UNBLOCKED ⁴	UNBLOCKED ⁴
		Gage	Width (inches)	6	4	2 ^{1/2}	2		
				6	6	4	3	Case 1	Cases 2-6
Structural 1	3/8	22	1 1/2	165	225	335	445	150	110
			2 1/2	190	250	375	500	165	125
		20	1 1/2	200	270	400	535	180	135
			2 1/2	225	300	450	600	200	150
SHEATHING, other grades covered in DOC PS 1 or DOC PS 2	3/8	22	1 1/2	150	200	300	400	135	100
			2 1/2	170	225	340	450	150	115
		20	1 1/2	180	240	360	480	160	120
			2 1/2	205	270	405	540	180	135

For SI: 1 inch = 25.4 mm, 1 lbf/ft = 14.6 N/m.

¹Values are for short-duration loads due to wind or earthquake, and must be reduced 25 percent for normal duration loading.

²The pin must be long enough to penetrate through the metal framing a minimum of 1/4 inch.

³The minimum panel edge distance is 3/8 inch.

⁴For fastener spacing and case descriptions, see UBC Table 23-II-H.

⁵Spacing of fasteners along intermediate framing members is 12 inches on center.

⁶Shear capacities in this table are limited by steel thickness. Use of thicker panels does not increase the allowable shear values.

TABLE 14—K VALUES FOR e_n DETERMINATION^{1,2}

GAGE OF STUD	STUD THICKNESS (inch)	MAXIMUM LOAD (pounds per fastener) ^{3,4}	K
14 ⁵	0.0710	215	730
16	0.0553	165	525
18	0.0428	135	430
20	0.0333	100	310
22	0.0275	85	203

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

¹K values for use in formula:

$$e_n = \left(\frac{\text{Load per fastener}}{K} \right)^3 \text{ For application of } e_n \text{ see Sections 23.222 and 23.223 of UBC Standard 23-2.}$$

²All values are based on 0.100-inch-diameter fastener except as noted for No. 14 gage stud.

³Maximum loads per fastener must not be exceeded. Lower loads may be used with the K values noted above.

⁴Fastener loads already include short term load increases. Values for fastener are determined from tables in this report by dividing the loads per foot by fastener spacing.

⁵K value for No. 14 gage stud is valid only if ET&F 0.144-inch-diameter fasteners are used. No K value for this gage is available for the 0.100-inch-diameter fasteners.