

STAPLED SHEET METAL BLOCKING FOR APA PANEL DIAPHRAGMS

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Allowable shear values for blocked structural panel diaphragms are significantly higher than those for unblocked diaphragms. Where blocked diaphragm values are required, panel edges are typically blocked with 2x lumber framing and fastened in accordance with recognized schedules in order to achieve desired shear values. There are instances, however, where installation of lumber blocking may not be convenient. One alternative is to substitute sheet metal strips for lumber blocking at panel joints. The technique has been evaluated by APA – *The Engineered Wood Association* and is discussed in this Technical Note.

Recommendations

Recommended design shear values are given in Table 1. Panel edges between framing shall be supported by tongue-and-groove joints or panel clips.

Recommendations are also applicable to two-layer systems where edge joints of the top layer are staggered from those of the bottom layer.

Performance is sensitive to staple overdriving, particularly when using 26-gage sheet metal strips. For this reason it is recommended that full inspection of workmanship be considered when sheet metal blocking is used. Staples should be driven so that the staple crown is flush with the top surface of the metal strip. Install staples with crowns oriented perpendicular to the plywood face grain or panel major axis.

Test Program

Recommendations were developed based on a test program conducted by APA. Loads were applied at the net rate of 0.1" per minute to specimens fabricated as shown in Figure 1. One hundred thirty-nine specimens were tested with varying panel thicknesses, sheet

metal gages, staple gages and staple spacings. All staples had a nominal crown width of 7/16".

Table 2 summarizes test results on those specimens which were configured in accordance with recommendations given in this Technical Note. Specimens not summarized are those which were substantially overdriven, including 14-gage staples through 26-gage sheet metal. For this combination it proved very difficult to control overdriving, and so it is not included in recommendations.

Table 2 includes load at a fastener slip of 0.015" divided by 1.6, a value commonly used to limit design load based on joint stiffness. Subsequent analysis of these test loads suggested a progression of design loads. Maximum load per staple was chosen to correspond to code-recognized lateral design loads; that is, 51 lb for 16-gage staples and 75 lb for 14-gage staples on a normal load duration basis⁽¹⁾. Resulting design loads are compared to ultimate test values to obtain load factors. It was determined that 19/32" Structural I and 23/32" APA Rated Sheathing plywood fully develop the lateral load capability of both the 16-gage and 14-gage staple, as shown in Table 1.

(1) Council of American Building Officials. 1989. *Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction*. National Evaluation Service Committee Report No. NER-272.

TABLE 1
RECOMMENDED DESIGN SHEAR (LB PER STAPLE)^(a)

APA Panel Grade	Gage		Minimum Panel Thickness (in.)				
	Staple	Sheet Metal ^(b)	5/16	3/8	15/32	19/32	23/32
APA Structural I Rated Sheathing	16	26	16	24	36	51	51
	16	24	16	24	36	51	51
	14 ^(c)	24	–	–	50	75	75
APA Rated Sheathing	16	26	14	22	32	47	51
	16	24	14	22	32	47	51
	14 ^(c)	24	–	–	45	68	75

(a) Based on normal duration of load.

(b) Strips 3" wide.

(c) 14-gage staples through 26-gage metal strips not recommended.

TABLE 2

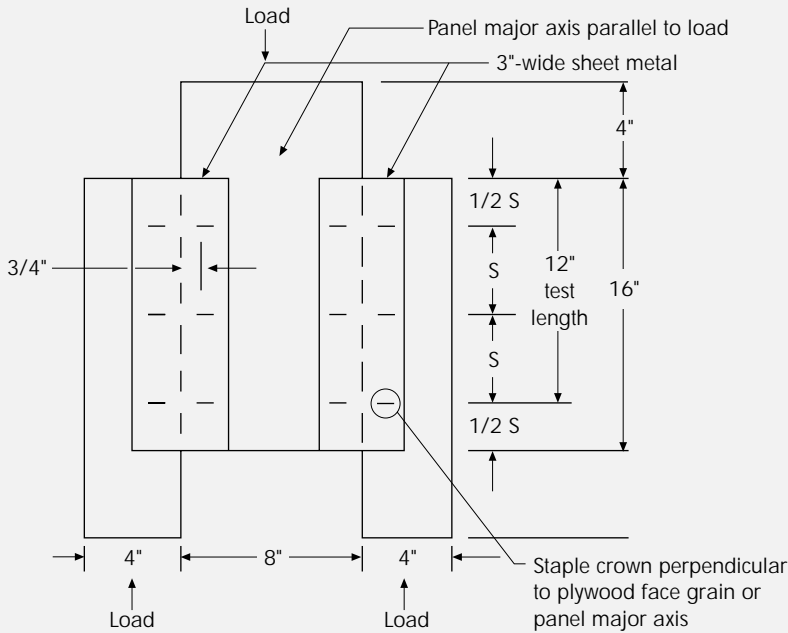
SUMMARY OF LATERAL LOAD TESTS ON STAPLED SHEET METAL BLOCKING

APA Panel Grade	Gage		Panel Thickness (in.)	Avg. Load (lb/staple)		Recommended Design Load (lb/staple)	Load Factor
	Staple	Sheet Metal		Ultimate Load (at Failure)	Load at 0.015" Slip Div. by 1.6		
APA Structural I Rated Sheathing	16	26	5/16	84	13	16	5.3
	16	26	15/32	206	62	36	5.7
	16	26	19/32	202	71	51	4.0
	16	26	23/32	207	74	51	4.0
	16	24	15/32	213	64	36	5.9
	16	24	19/32	233	76	51	4.6
	16	24	23/32	232	77	51	4.6
	14	24	15/32	247	60	50	4.9
	14	24	19/32	322	95	75	4.3
	14	24	23/32	395	114	75	5.3
APA Rated Sheathing	16	26	3/8	118	22	22	5.4
	16	26	1/2	163	44	32	5.1
	16	26	23/32	209	68	51	4.1
	16	24	3/8	146 ^(a)	-	22	6.6
	16	24	7/16	126 ^(a)	-	22	5.7
	16	24	15/32	165 ^(a)	-	32	5.1
	16	24	1/2	134 ^(a)	-	32	4.2
	16	24	1/2	203	38	32	6.3
	16	24	23/32	250	63	51	4.9

(a) Specimen subjected to 4000 passes under a 200-lb wheel load prior to testing.

FIGURE 1

TEST SPECIMEN



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APA

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