SUPPLEMENTAL
STRUCTURAL CALCULATIONS

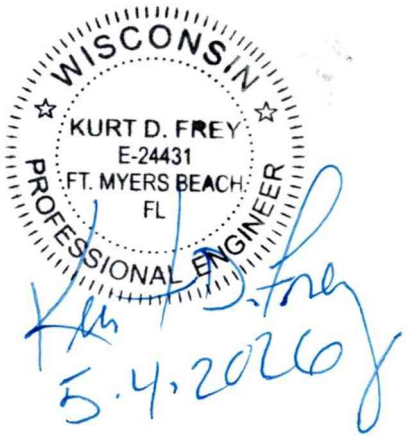
For

3- Season Porch
Residence
Madison, Wisconsin

by

ENNOVATION
ENGINEERING SERVICES INC

Date: May 4, 2026



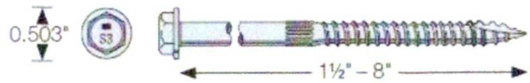
Strong-Drive®
SDS HEAVY-DUTY CONNECTOR Screw

SHEAR TRANSFER @ FLOOR

Heavy-Duty Simpson Strong-Tie Connectors, Indoor/Outdoor Projects

Codes/Standards: ICC-ES ESR-2236 (including City of LA Supplement), State of Florida FL9589

For more information: see p. 70, C-F-2025 *Fastening Systems* catalog



SDS Heavy-Duty Connector Screw — Allowable Shear Loads — Douglas Fir–Larch and Southern Pine Lumber

Fastener Length (in.)	Model No.	Reference DFL/SP Allowable Shear Loads (lb.) Wood Side Plate Thickness (in.)												
		½	⅝	¾	1	1⅛	1¼	1½	1¾	2½	3	3½	4	4½
2	SDS25200	145	—	—	—	—	—	—	—	—	—	—	—	—
2½	SDS25212	165	165	170	165	—	—	190[1]	—	—	—	—	—	—
3	SDS25300	165	165	170	185	195	205	280[1]	—	—	—	—	—	—
3½	SDS25312	165	165	170	185	195	205	340[1]	340[1]	—	—	—	—	—
4½	SDS25412	165	165	170	185	195	205	350[1]	340[1]	230	200	—	—	—
5	SDS25500	165	165	170	185	195	205	350[1]	340[1]	230	230	200	—	—
6	SDS25600	165	165	170	185	195	205	350[1]	340[1]	340[1]	340[1]	340[1]	230	200
8	SDS25800	165	165	170	185	195	205	350[1]	340[1]	340[1]	340[1]	340[1]	230	230

See footnotes below.

Vc REQ'D = 218 lb/FT
USE (2)-¼"φ × 5" SCREWS @ 16" OC

SDS Heavy-Duty Connector Screw — Allowable Shear Loads — Spruce-Pine-Fir and Hem-Fir

Fastener Length (in.)	Model No.	Reference SPF/HF Allowable Shear Loads (lb.) Wood Side Plate Thickness (in.)												
		½	⅝	¾	1	1⅛	1¼	1½	1¾	2½	3	3½	4	4½
2	SDS25200	105	—	—	—	—	—	—	—	—	—	—	—	—
2½	SDS25212	130	135	130	120	—	—	135[1]	—	—	—	—	—	—
3	SDS25300	130	140	140	150	150	145	200[1]	—	—	—	—	—	—
3½	SDS25312	130	140	140	150	155	165	245[1]	245[1]	—	—	—	—	—
4½	SDS25412	130	140	140	150	155	165	250[1]	245[1]	190	160	—	—	—
5	SDS25500	130	140	140	150	155	165	250[1]	245[1]	190	190	160	—	—
6	SDS25600	130	140	140	150	155	165	250[1]	245[1]	245[1]	245[1]	245[1]	190	160
8	SDS25800	130	140	140	150	155	165	250[1]	245[1]	245[1]	245[1]	245[1]	195	195

1. Noted loads are based on testing per ICC-ES AC233 and assume a minimum main member thickness of the screw length minus the side member thickness. All other allowable loads are based on the NDS and a minimum penetration of 6D = 1.5" into the main member.
2. Values are valid for a connection involving only two members. Where the side and main members have different specific gravities, the lower specific gravity shall be used.
3. Allowable loads are also applicable to structural composite lumber (e.g., LVL, PSL, and LSL) having an equivalent specific gravity of 0.50 or greater.
4. Allowable loads are shown at the wood load duration factor of C_D = 1.00. Loads may be increased for load duration by the building code up to a C_D = 1.60. The designer shall apply all adjustment factors required per NDS.
5. Loads are based on perpendicular installation into the side grain of the wood members.
6. Loads apply to corresponding stainless-steel models.
7. For in-service moisture greater than 19%, use C_M = 0.7.

ConnectionCalc Results

1/2" ¢ LAG SCREW WITHDRAWL CAPACITY

Analysis Type:

Design Method:	Allowable Stress
Connection Loading:	Withdrawal
Fastener Type:	Lag Screw

Main Member Parameters:

Main Member material category:	Solid Lumber/Timber
Type:	Spruce-Pine-Fir
Main Member Thickness:	11-1/2 in

Side Member Parameters:

Side Member material category:	Steel
Side Member Thickness:	12 gage

Lag Screw Parameters:

Lag Screw Nominal Diameter:	ø 1/2"
Length:	6 in
Washer Thickness:	USS 1/2" (ø0.109)

Analysis Factors:

Load Duration (CD):	1
Wet Service (CM):	

	1
End Grain (Ceg):	1
Temperature Factor (Ct):	1

Results

Adjusted ASD Capacity:	ALLOWABLE 927 lb

Notes

REQ'D = 655 lb OK

Withdrawal Results Rounding:	nearest 1 lb
Fastener pull through capacity:	Head pull through not addressed

Disclaimer:

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of-the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this Connection Calculator. Those using this Connection Calculator assume all liability from its use.

Analysis Parameters

PT SYP 2x14 Stair Stringer

Effective area, however, is equivalent to a 2×8

NDS-style ASD | Southern Yellow Pine No. 2, pressure-treated

Problem setup

Member: PT SYP 2×8 No.2 | Spacing: 10″ o.c. → tributary width = 0.833 ft

- Dead = 10 psf | Live = 40 psf → Total = **50 psf**
- Main span $L = 13.5$ ft | Cantilever $a = 3.5$ ft

$$w = 50 \times 0.833 = 41.7 \text{ plf}$$

Section properties

Actual size: 1.5″ × 7.25″

$$S = \frac{bh^2}{6} = \frac{1.5 \cdot 7.25^2}{6} = 13.14 \text{ in}^3$$

$$I = \frac{bh^3}{12} = 47.7 \text{ in}^4$$

Material properties (PT SYP, wet service)

- $F_b = 1200$ psi | $F_v = 175$ psi | $E = 1{,}400{,}000$ psi
- Wet Service Factor C_M per NDS Supplement Table 4A:

Property	Reference Value	C_M	Adjusted Value
F_b	1200 psi	0.85	1020 psi
F_v	175 psi	0.97	170 psi
E	1,400,000 psi	0.90	1,260,000 psi

$$F_b' = 1200 \times 0.85 = 1020 \text{ psi}$$

Bending analysis

Positive moment (main span)

$$M_+ = \frac{wL^2}{8} = \frac{41.7 \cdot 13.5^2}{8} = 950 \text{ ft-lbs}$$

Negative moment (cantilever at support)

$$M_- = \frac{wa^2}{2} = \frac{41.7 \cdot 3.5^2}{2} \approx 255 \text{ ft-lbs}$$

Governing moment: positive moment controls (950 ft-lbs)

Bending capacity

,

$$M_{\text{allow}} = F_b' \cdot S = 1020 \cdot 13.14 = 13{,}403 \text{ in-lbs} = 1{,}117 \text{ ft-lbs}$$

Demand: 950 ft-lbs | Capacity: 1,117 ft-lbs | Utilization ≈ 85% → **PASS**

Shear check

$$V \approx \frac{wL}{2} = \frac{41.7 \cdot 13.5}{2} \approx 281 \text{ lbs}$$

$$V_{\text{allow}} = \frac{2}{3} F_v' bd = \frac{2}{3} \cdot 170 \cdot 1.5 \cdot 7.25 \approx 1{,}233 \text{ lbs}$$

Demand: 281 lbs | Capacity: 1,233 lbs | Utilization ≈ 23% → **PASS**

Deflection analysis

$$\Delta = \frac{5wL^4}{384EI} \quad w = 3.47 \text{ lb/in},\ L = 162 \text{ in},\ E' = 1{,}260{,}000 \text{ psi}$$

$$\Delta = \frac{5 \cdot 3.47 \cdot 162^4}{384 \cdot 1{,}260{,}000 \cdot 47.7} \approx 0.29''$$

Actual: 0.29″ | Allowable $L/480 = 162/480 = 0.34''$ | Utilization ≈ 85% → **PASS**

Cantilever deflection

$$\Delta_{\text{cant}} = \frac{wa^4}{8EI} \approx 0.06''$$

Negligible — no concern.

Summary

Check	Demand	Capacity	Utilization	Result
Bending	950 ft-lbs	1,117 ft-lbs	85%	PASS
Shear	281 lbs	1,233 lbs	23%	PASS
Deflection	0.29″	0.34″	85%	PASS
Cantilever	0.06″	—	negligible	PASS
