

# WIND UPLIFT FORCES ON ROOF DECK

## Welds

### DECK TO STRUCTURAL STEEL OR BAR JOISTS

The new AISI Specifications provide higher weld uplift strengths than were previously obtained. The uplift forces shown are based on the new AISI Specifications and on the steel properties that produce the lowest weld strengths over the range of steels used to produce deck. For LRFD apply a  $\phi$  factor 0.60 to the tabulated loads; for ASD use a safety factor of 2.5. It may be appropriate to take advantage of the 1/3 increase allowed for wind load when using ASD.

Uplift Force, Lbs. per weld

Case #	Gage	Visible Weld Diameter				Case
		.5	.625	.75	1.0	
1	22	550	690	840	1130	
	20	660	830	1010	1360	
	18	850	1080	1310	1780	
	16	1040	1330	1630	2220	
2	22	870	1150	1440	2000	
	20	980	1330	1670	2360	
	18	1130	1590	2050	2960	
	16	1200	1780	2350	3500	
3	22	380	490	590	790	
	20	460	580	710	950	
	18	590	760	920	1250	
	16	730	930	1140	1550	

Case 1. Single deck thickness.

Case 2. Two layers of deck such as at an end lap.

Case 3. At a side lap (on structural steel or bar joist).

## Screws

### DECK TO STRUCTURAL STEEL BAR JOISTS, GAGE FRAMING

Pull over strength generally controls the uplift values of screws. The table for pull over covers roof deck with a tensile strength ( $F_u$ ) of 45 ksi which is the lowest of the acceptable range for roof deck, and 60 ksi for form deck. The roof deck gage range is 16 to 22 gage; the form deck gages are 24, 26, 28.

Screw pull out from structural steel framing or from joists is not a failure mode. Pull out failure is a definite possibility when light gage framing is used. The table shows pull out values form steel with 33, 40 and 50 ksi yields with corresponding tensile strength of 45, 55, and 65 ksi.

SCREW DATA			
Screw Size	d dia.	d <sub>h</sub> nom. head dia	Avg. tested tensile strength, kips
10	0.190	0.415 or 0.400	2.56
12	0.210	0.430 or 0.400	3.62
1/4	0.250	0.480 or 0.520	4.81



Pull Out Strength, Lbs. =  $P_{net} = 850 t_2 d F_u$

Screw #	$F_u$	Gage, t, d $F_u$						
		10	12	14	16	18	20	22
10	45	980	760	540	435	345	260	215
	55	1190	930	665	530	420	320	260
	65	1410	1100	785	630	500	375	310
12	45	1080	840	600	480	380	290	235
	55	1320	1030	735	590	465	350	290
	65	1560	1210	865	695	550	415	340
1/4	45	1290	1000	715	570	455	340	280
	55	1570	1220	875	700	555	420	345
	65	1860	1440	1030	825	655	495	405

\* Use the SDI decimal thickness,  $t_2$  for the gage.

The safety factor for pull over and pullout (ASD) is 3, but for wind loading the 1/3 load increase may be proper. The  $\phi$  factor (LRFD) is 0.5.

Pull Over Values, Lbs.

$d_w$	Gage						
	16	18	20	22	24	28	28
0.400	1610	1280	970	800	860	640	540
0.415	1680	1330	1000	830	890	670	560
0.430	1740	1380	1040	860	920	690	580
0.480	1940	1540	1160	960	1030	770	640
0.500	2020	1600	1210	1000	1080	810	670

The table pull over strengths lbs., are based on  $F_u = 45$  ksi for 16 thru 22 gage, and 60 ksi for 24 thru 28 gage.