

**Table 11.2C Nail and Spike Reference Withdrawal Design Values, W<sup>1</sup>**

Specific Gravity, G <sup>2</sup>	Plain Shank Nail and Spike																	Threaded Nail				
	Diameter, D																	Diameter, D				
	0.099"	0.113"	0.128"	0.131"	0.135"	0.148"	0.162"	0.192"	0.207"	0.225"	0.244"	0.263"	0.283"	0.312"	0.375"	0.120"	0.135"	0.148"	0.177"	0.207"		
0.73	62	71	80	82	85	93	102	121	130	141	153	165	178	196	236	82	93	102	121	141		
0.71	58	66	75	77	79	87	95	113	121	132	143	154	166	183	220	77	87	95	113	132		
0.68	52	59	67	69	71	78	85	101	109	118	128	138	149	164	197	69	78	85	101	118		
0.67	50	57	65	66	68	75	82	97	105	114	124	133	144	158	190	66	75	82	97	114		
0.58	35	40	45	46	48	52	57	68	73	80	86	93	100	110	133	46	52	57	68	80		
0.55	31	35	40	41	42	46	50	59	64	70	76	81	88	97	116	41	46	50	59	70		
0.51	25	29	33	34	35	38	42	49	53	58	63	67	73	80	96	34	38	42	49	58		
0.50	24	28	31	32	33	36	40	47	50	55	60	64	69	76	91	32	36	40	47	55		
0.49	23	26	30	30	31	34	38	45	48	52	57	61	66	72	87	30	34	38	45	52		
0.47	21	24	27	27	28	31	34	40	43	47	51	55	59	65	78	27	31	34	40	47		
0.46	20	22	25	26	27	29	32	38	41	45	48	52	56	62	74	26	29	32	38	45		
0.44	18	20	23	23	24	26	29	34	37	40	43	47	50	55	66	23	26	29	34	40		
0.43	17	19	21	22	23	25	27	32	35	38	41	44	47	52	63	22	25	27	32	38		
0.42	16	18	20	21	21	23	26	30	33	35	38	41	45	49	59	21	23	26	30	35		
0.41	15	17	19	19	20	22	24	29	31	33	36	39	42	46	56	19	22	24	29	33		
0.40	14	16	18	18	19	21	23	27	29	31	34	37	40	44	52	18	21	23	27	31		
0.39	13	15	17	17	18	19	21	25	27	29	32	34	37	41	49	17	19	21	25	29		
0.38	12	14	16	16	17	18	20	24	25	28	30	32	35	38	46	16	18	20	24	28		
0.37	11	13	15	15	16	17	19	22	24	26	28	30	33	36	43	15	17	19	22	26		
0.36	11	12	14	14	14	16	17	21	22	24	26	28	30	33	40	14	16	17	21	24		
0.35	10	11	13	13	14	15	16	19	21	23	24	26	28	31	38	13	15	16	19	23		
0.31	7	8	9	10	10	11	12	14	15	17	18	19	21	23	28	10	11	12	14	17		

1. Tabulated withdrawal design values, W, for nail or spike connections shall be multiplied by all applicable adjustment factors (see Table 10.3.1).  
 2. Specific gravity, G, shall be determined in accordance with Table 11.3.3A.

**Table 11.2D Post-Frame Ring Shank Nail Reference Withdrawal Design Values,  $W^1$**

Tabulated withdrawal design values,  $W$ , are in pounds per inch of ring shank penetration into side grain of wood member (see Appendix Table L5).

Specific Gravity, $G^2$	Diameter, $D$ (in.)				
	0.135	0.148	0.177	0.200	0.207
0.73	129	142	170	192	199
0.71	122	134	161	181	188
0.68	112	123	147	166	172
0.67	109	120	143	162	167
0.58	82	90	107	121	125
0.55	74	81	96	109	113
0.51	63	69	83	94	97
0.50	61	67	80	90	93
0.49	58	64	76	86	89
0.47	54	59	70	80	82
0.46	51	56	67	76	79
0.44	47	52	62	70	72
0.43	45	49	59	67	69
0.42	43	47	56	64	66
0.41	41	45	54	61	63
0.40	39	43	51	58	60
0.39	37	41	48	55	57
0.38	35	38	46	52	54
0.37	33	36	44	49	51
0.36	31	35	41	47	48
0.35	30	33	39	44	46
0.31	23	26	31	35	36

1. Tabulated withdrawal design values,  $W$ , for post-frame ring shank nails shall be multiplied by all applicable adjustment factors (see Table 10.3.1).

2. Specific gravity,  $G$ , shall be determined in accordance with Table 11.3.3A.

## 11.3 Reference Lateral Design Values

### 11.3.1 Yield Limit Equations

Reference lateral design values,  $Z$ , for single shear and symmetric double shear connections using dowel-type fasteners shall be the minimum computed yield mode value using equations in Tables 11.3.1A and 11.3.1B (see Figures 11B, 11C, and Appendix I) where:

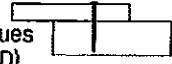
- the faces of the connected members are in contact;
- the load acts perpendicular to the axis of the dowel;
- edge distances, end distances, and spacing are not less than the requirements in 11.5; and
- for lag screws, wood screws, and nails and spikes, the length of fastener penetration,  $p$ , into the main member of a single shear connection or the side member of a double shear connection is greater than or equal to  $p_{\min}$  (see 11.1).

### 11.3.2 Common Connection Conditions

Reference lateral design values,  $Z$ , for connections with bolts (see Tables 11A through I), lag screws (see Tables 11J and K), wood screws (see Tables 11L and M), nails and spikes (see Tables 11N through R), and post-frame ring shank nails (see Tables 11S and T), are calculated for common connection conditions in accordance with yield mode equations in Tables 11.3.1A and 11.3.1B. Tabulated reference lateral design values,  $Z$ , shall be multiplied by applicable Table footnotes to determine an adjusted lateral design value,  $Z'$ .

**Table 11N COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**

for sawn lumber or SCL with both members of identical specific gravity (tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)



NAILS

DOWEL-TYPE FASTENERS

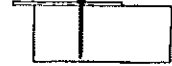


Side Member Thickness <i>t</i> in. m.	Nail Diameter <i>D</i> in. m.	Common Wire Nail Box Nail Sinker Nail	Species										
			G=0.67 Red Oak	G=0.55 Mixed Maple Southern Pine	G=0.5 Douglas Fir-Larch	G=0.49 Douglas Fir-Larch (N)	G=0.46 Douglas Fir(S) Hem-Fir(N)	G=0.43 Hem-Fir	G=0.42 Spruce-Pine-Fir	G=0.37 Redwood (open grain)	G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars	G=0.35 Northern Species	
3/4	0.099	6d 7d	73	61	55	54	51	48	47	39	38	36	
		6d 8d 8d	94	79	72	71	65	58	57	47	46	44	
	0.120	10d	107	89	80	77	71	64	62	52	50	48	
		10d	121	101	93	91	84	70	68	57	56	54	
	0.131	8d	127	104	90	87	80	73	70	60	58	56	
		16d 12d	135	108	94	91	84	76	74	63	61	58	
	0.148	10d 20d 16d	154	121	105	102	94	85	83	70	69	66	
		16d 40d	183	138	121	117	108	99	96	82	80	77	
	0.177	20d	200	153	134	130	121	111	107	92	89	87	
		20d 30d	208	157	138	134	125	114	111	95	93	90	
	0.207	30d 40d	216	166	147	143	133	122	119	103	101	97	
		40d	229	178	158	154	144	132	129	112	110	106	
	0.244	50d	234	182	162	158	147	136	132	115	113	109	
		6d 7d	73	61	55	54	51	48	47	42	41	40	
1	0.099	6d 8d 8d	94	79	72	71	67	63	61	55	54	51	
		10d	107	89	81	80	76	71	69	60	58	56	
	0.120	10d	121	101	93	91	86	80	79	68	66	61	
		8d	127	106	97	95	90	84	82	68	66	63	
	0.135	16d 12d	135	113	103	101	96	89	86	71	69	66	
		10d 20d 16d	154	128	118	115	109	99	96	80	77	74	
	0.162	16d 40d	184	154	141	137	125	113	109	91	88	85	
		20d	213	178	159	154	142	128	124	105	102	98	
	0.192	20d 30d	222	183	167	162	149	135	131	111	109	104	
		30d 40d	243	192	167	162	149	135	131	111	109	104	
	0.225	40d	268	202	177	171	159	144	140	120	117	112	
		50d	274	207	181	175	162	148	143	123	120	115	
	1-1/4	0.099	6d 8d 7d	73	61	55	54	51	48	47	42	41	40
			6d 8d 8d	94	79	72	71	67	63	61	55	54	51
0.120		10d	107	89	81	80	76	71	69	62	60	59	
		10d	121	101	93	91	86	80	79	70	69	67	
0.131		8d	127	106	97	95	90	84	82	73	72	70	
		16d 12d	135	113	103	101	96	89	86	78	76	74	
0.148		10d 20d 16d	154	128	118	115	109	102	100	88	87	84	
		16d 40d	184	154	141	138	131	122	120	103	100	95	
0.177		20d	213	178	163	159	151	141	138	123	121	117	
		20d 30d	222	185	170	166	157	147	144	128	126	120	
0.207		30d 40d	243	203	186	182	172	161	158	135	131	125	
		40d	268	224	200	193	177	160	155	130	127	121	
0.244		50d	278	230	204	197	181	163	158	133	129	124	
		6d 7d	73	61	55	54	51	48	47	42	41	40	
1-1/2	0.099	6d 8d 8d	94	79	72	71	67	63	61	55	54	51	
		10d	107	89	81	80	76	71	69	62	60	59	
	0.120	10d	121	101	93	91	86	80	79	70	69	67	
		8d	127	106	97	95	90	84	82	73	72	70	
	0.135	16d 12d	135	113	103	101	96	89	86	78	76	74	
		10d 20d 16d	154	128	118	115	109	102	100	88	87	84	
	0.162	16d 40d	184	154	141	138	131	122	120	106	104	101	
		20d	213	178	163	159	151	141	138	123	121	117	
	0.192	20d 30d	222	185	170	166	157	147	144	128	126	120	
		30d 40d	243	203	186	182	172	161	158	135	131	125	
	0.225	40d	268	224	205	201	190	178	172	143	138	132	
		50d	278	230	211	208	196	181	175	148	141	135	
	1-3/4	0.099	6d 8d 8d	94	79	72	71	67	63	61	55	54	51
			10d	107	89	81	80	76	71	69	62	60	59
0.120		10d	121	101	93	91	86	80	79	70	69	67	
		16d 12d	135	113	103	101	96	89	86	78	76	74	
0.148		10d 20d 16d	154	128	118	115	109	102	100	88	87	84	
		16d 40d	184	154	141	138	131	122	120	106	104	101	
0.177		20d	213	178	163	159	151	141	138	123	121	117	
		20d 30d	222	185	170	166	157	147	144	128	126	120	
0.207		30d 40d	243	203	186	182	172	161	158	135	131	125	
		40d	268	224	205	201	190	178	172	143	138	132	
0.244		50d	278	230	211	208	196	181	175	148	141	135	
		6d 7d	73	61	55	54	51	48	47	42	41	40	

1. Tabulated lateral design values, Z, shall be multiplied by all applicable adjustment factors (see Table 10.3.1).  
 2. Tabulated lateral design values, Z, are for common, box, or sinker steel wire nails (see Appendix Table L-1) inserted in side grain with nail axis perpendicular to wood fibers; nail penetration, p, into the main member equal to 10D; and nail bending yield strengths, F<sub>b</sub>, of 100,000 psi for 0.099" ≤ D ≤ 0.142", 90,000 psi for 0.142" < D ≤ 0.177", 80,000 psi for 0.177" < D ≤ 0.236", and 70,000 psi for 0.236" < D ≤ 0.273".  
 3. Where the nail or spike penetration, p, is less than 10D but not less than 6D, tabulated lateral design values, Z, shall be multiplied by p/10D or lateral design values shall be calculated using the provisions of 11.3 for the reduced penetration.  
 4. Nail length is insufficient to provide 10D penetration. Tabulated lateral design values, Z, shall be adjusted per footnote 3.

**Table 11P COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**

for sawn lumber or SCL with ASTM 653, Grade 33 steel side plate  
(tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)



Side Member Thickness <i>t</i> in.	Nail Diameter <i>D</i> in.	Common Wire Nail		G=0.67 Red Oak	G=0.55 Mixed Maple Southern Pine	G=0.5 Douglas Fir-Larch	G=0.49 Douglas Fir-Larch (N)	G=0.46 Douglas Fir(S) Hem-Fir(N)	G=0.43 Hem-Fir	G=0.42 Spruce-Pine-Fir	G=0.37 Redwood (open grain)	G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods	G=0.35 Northern Species	
		Box Nail	Sinker Nail											
		Pennyweight		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
0.036 (20 gage)	0.099	6d	7d	59	59	54	53	51	48	47	42	41	40	
		8d	8d	89	76	70	69	66	62	60	54	53	52	
	0.120	10d		100	86	79	77	74	69	68	61	60	58	
		8d		114	97	90	88	84	78	77	69	68	66	
	0.131	8d		120	102	94	92	88	82	81	72	71	71	68
		16d	12d	127	108	100	98	93	87	86	77	75	73	73
		10d	20d	145	123	114	111	106	100	98	87	86	83	83
0.048 (18 gage)	0.099	6d	7d	70	60	55	54	52	49	48	43	42	41	
		8d	8d	90	77	71	70	67	63	61	55	54	53	
	0.120	10d		101	87	80	78	75	70	69	62	61	59	
		8d		116	98	91	88	85	80	78	70	69	67	
	0.131	8d		120	103	95	93	89	83	82	73	72	70	
		16d	12d	128	109	101	99	94	88	87	78	76	74	
	0.148	10d	20d	145	124	115	112	107	101	99	88	87	84	
		16d	40d	174	148	137	134	128	120	118	105	104	101	
	0.177	20d	30d	201	171	158	155	147	138	136	122	119	116	
		30d	40d	209	178	164	161	153	144	141	126	124	121	
	0.207	40d	60d	229	195	179	175	167	157	154	138	136	132	
60d			228	195	179	175	167	157	154	138	136	132		
0.060 (16 gage)	0.099	6d	7d	72	62	57	56	54	51	50	45	44	43	
		8d	8d	92	79	73	72	68	64	63	57	56	54	
	0.120	10d		103	88	82	80	76	72	71	63	62	61	
		8d		117	100	92	91	86	81	80	72	70	68	
	0.131	8d		122	104	97	95	90	85	83	75	73	71	
		16d	12d	129	111	102	100	96	90	88	79	78	76	
	0.148	10d	20d	147	126	116	114	109	102	100	90	89	86	
		16d	40d	175	150	138	135	129	121	119	107	105	102	
	0.177	20d	30d	202	172	159	156	149	140	137	123	121	117	
		30d	40d	210	179	165	162	154	145	142	128	125	122	
	0.207	40d	60d	229	195	180	177	168	159	155	139	137	133	
60d			253	215	199	195	185	174	171	153	150	146		
0.244	60d		260	221	204	200	191	179	176	157	155	150		
			250	221	204	200	191	179	176	157	155	150		
0.075 (14 gage)	0.099	6d	7d	75	65	60	59	56	53	52	47	46	45	
		8d	8d	95	82	76	75	71	67	66	59	58	57	
	0.120	10d		106	91	85	83	79	75	73	66	65	63	
		8d		120	103	95	93	89	84	82	74	73	71	
	0.131	8d		125	107	99	97	93	88	86	77	76	74	
		16d	12d	132	113	105	103	98	93	91	82	80	78	
	0.148	10d	20d	150	129	119	117	111	105	103	92	91	88	
		16d	40d	178	152	141	138	132	124	122	109	107	104	
	0.177	20d	30d	204	175	162	158	151	142	139	125	123	120	
		30d	40d	212	182	168	165	157	148	146	130	128	124	
	0.207	40d	60d	231	198	183	179	171	161	157	141	139	135	
60d			264	217	201	197	187	176	173	155	152	148		
0.244	60d		261	223	206	202	193	181	178	159	156	152		
			261	223	206	202	193	181	178	159	156	152		
0.105 (12 gage)	0.099	6d	7d	84	73	68	67	64	60	59	53	53	51	
		8d	8d	104	90	84	82	79	74	73	66	65	63	
	0.120	10d		116	100	93	91	87	82	80	73	71	69	
		8d		129	111	103	101	97	91	90	81	79	77	
	0.131	8d		134	116	107	105	101	95	93	84	82	80	
		16d	12d	141	122	113	111	106	100	98	88	87	84	
	0.148	10d	20d	159	137	127	125	119	113	110	99	98	95	
		16d	40d	187	161	149	146	140	132	129	116	114	111	
	0.177	20d	30d	213	183	169	166	159	149	147	132	130	126	
		30d	40d	220	189	176	172	164	155	152	137	134	131	
	0.207	40d	60d	239	205	190	186	177	167	164	147	145	141	
60d			260	223	207	203	193	182	179	161	158	153		
0.244	60d		268	230	212	208	199	187	183	165	162	158		
			268	230	212	208	199	187	183	165	162	158		

1. Tabulated lateral design values, Z, shall be multiplied by all applicable adjustment factors (see Table 10.3.1).
2. Tabulated lateral design values, Z, are for common, box, or sinker steel wire nails (see Appendix Table L4) inserted in side grain with nail axis perpendicular to wood fibers; nail penetration, p, into the main member equal to 10D; dowel bearing strength,  $F_p$ , of 61,850 psi for ASTM A653, Grade 33 steel and nail bending yield strengths,  $F_u$ , of 100,000 psi for  $0.099" \leq D \leq 0.142"$ , 90,000 psi for  $0.142" < D \leq 0.177"$ , 80,000 psi for  $0.177" < D \leq 0.236"$ , 70,000 psi for  $0.236" < D \leq 0.273"$
3. Where the nail or spike penetration, p, is less than 10D but not less than 6D, tabulated lateral design values, Z, shall be multiplied by p/10D or lateral design values shall be calculated using the provisions of 11.3 for the reduced penetration.

**Table 11P COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**

for sawn lumber or SCL with ASTM 653, Grade 33 steel side plate  
(tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)



NAILS

DOWEL-TYPE FASTENERS

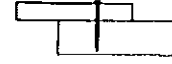
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Side Member Thickness <i>t</i> in.	Nail Diameter <i>D</i> in.	Common Wire Nail		G-0.67 Red Oak	G-0.55 Mixed Maple Southern Pine	G-0.5 Douglas Fir-Larch	G-0.49 Douglas Fir-Larch (N)	G-0.46 Douglas Fir(S) Hem-Fir(N)	G-0.43 Hem-Fir	G-0.42 Spruce-Pine-Fir	G-0.37 Redwood (open grain)	G-0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods	G-0.35 Northern Species	
		Box Nail	Sinker Nail											
0.120 (11 gage)	0.099	6d	7d	90	78	72	71	68	64	63	57	56	53	
			8d	110	95	89	87	83	79	77	70	68	66	
	0.120	10d		121	105	97	96	91	86	85	76	75	73	
				134	116	108	106	101	96	94	85	83	81	
	0.131	8d		140	121	112	110	105	99	97	88	86	84	
			16d	147	127	118	116	110	104	102	92	91	88	
	0.148	10d	20d	165	143	133	130	124	117	115	104	102	99	
			16d	193	166	154	152	145	137	134	121	119	115	
	0.162	16d	40d	218	188	174	171	163	154	151	136	136	134	130
				226	195	181	177	169	159	156	141	141	138	135
	0.177	20d	30d	244	210	194	191	182	172	168	151	151	149	145
			40d	265	228	211	207	198	186	183	164	164	161	157
	0.207	30d	40d	272	234	217	213	203	191	187	169	169	166	161
			50d											
	0.134 (10 gage)	0.099	6d	7d	95	82	76	74	71	66	65	58	56	54
8d				116	100	93	92	88	83	81	73	72	69	
0.120		10d		127	110	102	100	96	91	89	80	79	76	
				140	122	113	111	106	100	98	89	87	85	
0.131		8d		146	126	117	115	110	104	102	92	90	88	
			16d	153	132	123	121	115	109	107	96	95	92	
0.148		10d	20d	172	148	138	135	129	122	120	108	106	104	
			16d	199	172	160	157	150	142	139	125	123	120	
0.162		16d	40d	224	194	180	176	169	159	156	141	138	135	
				232	200	186	182	174	164	161	145	143	139	
0.177		20d	30d	249	215	199	195	187	176	173	156	153	149	
			40d	270	233	216	212	202	191	187	168	165	161	
0.207		30d	40d	277	239	221	217	207	195	192	173	170	165	
			50d											
0.179 (7 gage)		0.099	6d	7d	97	82	76	74	71	66	65	58	56	54
	8d			126	107	99	97	92	86	84	76	74	70	
	0.120	10d		142	121	111	109	104	97	95	85	83	79	
				161	137	126	124	118	111	108	97	94	90	
	0.131	8d		168	144	132	130	123	116	114	102	99	94	
			16d	175	152	141	138	131	123	121	108	105	100	
	0.148	10d	20d	195	170	158	155	148	140	137	123	121	117	
			16d	224	194	180	177	169	160	157	142	140	136	
	0.162	16d	40d	249	215	200	197	188	178	174	167	155	151	
				256	222	208	203	194	183	178	162	159	155	
	0.177	20d	30d	272	236	218	215	205	194	190	172	169	164	
			40d	292	252	234	230	220	207	203	184	180	176	
	0.207	30d	40d	299	258	240	235	225	212	208	188	185	180	
			50d											
	0.239 (3 gage)	0.099	6d	7d	97	82	76	74	71	66	65	58	56	54
8d				126	107	99	97	92	86	84	76	74	70	
0.120		10d		142	121	111	109	104	97	95	85	83	79	
				161	137	126	124	118	111	108	97	94	90	
0.131		8d		169	144	132	130	123	116	114	102	99	94	
			16d	180	153	141	138	131	123	121	108	105	100	
0.148		10d	20d	205	174	160	157	149	140	137	123	121	117	
			16d	245	209	192	188	179	168	165	147	145	140	
0.162		16d	40d	284	241	222	218	207	195	191	170	167	162	
				295	251	231	227	216	202	198	177	174	169	
0.177		20d	30d	310	270	251	246	236	222	217	194	191	185	
			40d	328	285	265	260	249	235	231	209	205	200	
0.207		30d	40d	336	291	271	266	254	240	236	213	210	204	
			50d											

1. Tabulated lateral design values, Z, shall be multiplied by all applicable adjustment factors (see Table 10.3.1).  
 2. Tabulated lateral design values, Z, are for common, box, or sinker steel wire nails (see Appendix Table L4) inserted in side grain with nail axis perpendicular to wood fibers, nail penetration, p, into the main member equal to 10D; dowel bearing strength,  $F_{\perp}$ , of 61,850 psi for ASTM A653, Grade 33 steel and nail bending yield strengths,  $F_{\perp}$ , of 100,000 psi for  $0.099" \leq D \leq 0.142"$ , 90,000 psi for  $0.142" < D \leq 0.177"$ , 80,000 psi for  $0.177" < D \leq 0.236"$ , 70,000 psi for  $0.236" < D \leq 0.273"$ .  
 3. Where the nail or spike penetration, p, is less than 10D but not less than 6D, tabulated lateral design values, Z, shall be multiplied by  $p/10D$  or lateral design values shall be calculated using the provisions of 11.3 for the reduced penetration.

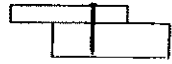
NAILS

**Table 11Q COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**  
 for sawn lumber or SCL with wood structural panel side members with an effective G=0.50  
 (tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)



Side Member Thickness	D Nail Diameter	Common Wire Nail		G=0.67 Red Oak	G=0.55 Mixed Maple Southern Pine	G=0.5 Douglas Fir-Larch	G=0.49 Douglas Fir-Larch (N)	G=0.46 Douglas Fir(S) Hem-Fir(N)	G=0.43 Hem-Fir	G=0.42 Spruce-Pine-Fir	G=0.37 Redwood (open grain)	G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods	G=0.35 Northern Species	
		Box Nail	Sinker Nail											
3/8	0.099	6d	7d	47	45	43	43	42	40	40	38	37	37	
		6d	8d	60	56	54	54	52	51	50	47	47	46	
	0.120	10d	10d	67	62	60	60	58	55	50	52	52	51	
		8d	10d	75	70	68	67	65	63	63	59	58	57	
	0.131	8d	10d	78	73	71	70	68	66	65	61	61	60	
		16d	12d	83	78	75	74	72	70	69	65	64	63	
	0.148	10d	20d	94	88	85	84	82	79	78	73	72	71	
		16d	40d	114	106	102	101	99	96	95	89	88	86	
	7/16	0.099	6d	7d	50	47	45	45	44	43	42	40	40	39
			6d	8d	62	58	56	56	55	53	52	49	49	48
0.120		10d	10d	69	65	63	62	60	59	58	55	54	53	
		8d	10d	77	72	70	69	68	66	65	61	60	59	
0.131		8d	10d	80	75	73	72	70	69	67	63	63	62	
		16d	12d	85	80	77	76	74	72	71	67	66	65	
0.148		10d	20d	96	90	87	86	84	81	80	76	75	73	
		16d	40d	114	106	102	101	99	96	95	89	88	86	
15/32		0.099	6d	7d	51	48	47	46	45	44	44	41	41	40
			6d	8d	64	60	58	57	56	54	54	51	50	49
	0.120	10d	10d	70	66	64	63	62	60	59	56	55	54	
		8d	10d	78	74	71	71	69	67	66	62	62	61	
	0.131	8d	10d	82	77	74	73	72	70	69	65	64	63	
		16d	12d	86	81	78	77	76	73	72	68	67	66	
	0.148	10d	20d	97	91	88	87	85	83	82	77	76	75	
		16d	40d	115	108	104	103	100	97	96	90	89	88	
	19/32	0.099	6d	7d	58	55	53	53	51	50	50	47	46	46
			6d	8d	70	66	64	64	62	61	60	57	56	55
0.120		10d	10d	77	73	70	70	68	66	66	62	61	60	
		8d	10d	85	80	78	77	75	73	72	68	68	67	
0.131		8d	10d	89	83	80	80	78	76	76	71	70	69	
		16d	12d	93	87	84	84	82	79	79	74	73	72	
0.148		10d	20d	104	98	95	94	92	89	88	83	82	81	
		16d	40d	121	114	110	109	107	103	102	96	95	94	
0.177		20d	20d	137	128	124	123	120	116	115	108	107	105	
		20d	30d	142	133	128	127	124	120	119	112	111	109	
23/32	0.099	6d	7d	62	58	55	55	53	51	51	47	47	46	
		6d	8d	78	74	72	71	69	67	66	62	61	60	
	0.120	10d	10d	85	80	78	77	76	73	73	69	68	67	
		8d	10d	93	88	85	85	83	80	80	75	75	74	
	0.131	8d	10d	96	91	88	87	86	83	82	78	77	76	
		16d	12d	101	95	92	91	89	87	86	81	81	78	
	0.148	10d	20d	113	106	103	102	100	97	96	91	90	89	
		16d	40d	130	122	118	117	115	111	110	104	103	102	
	0.177	20d	20d	145	137	132	131	128	124	123	116	115	113	
		20d	30d	150	141	135	135	132	128	127	120	118	116	
1	0.099	6d	7d	62	58	55	55	53	51	51	47	47	46	
		6d	8d	81	75	72	71	69	67	66	62	61	60	
	0.120	10d	10d	92	85	81	81	78	76	75	69	69	67	
		8d	10d	104	97	93	92	89	88	85	78	78	77	
	0.131	8d	10d	109	101	97	98	93	90	89	83	82	80	
		16d	12d	116	108	103	102	99	96	94	88	87	85	
	0.148	10d	20d	132	123	118	116	113	109	108	100	99	97	
		16d	40d	154	146	141	139	135	131	129	120	119	116	
	0.177	20d	20d	169	160	155	154	151	146	145	137	136	134	
		20d	30d	174	164	159	158	155	150	149	141	140	138	
1-1/8	0.120	10d	10d	104	97	93	92	89	86	85	79	78	77	
		8d	10d	109	101	97	96	93	90	89	83	82	80	
	0.131	16d	12d	116	108	103	102	99	96	94	88	87	85	
		10d	20d	132	123	118	116	113	109	108	100	99	97	
	0.148	16d	40d	159	147	141	139	135	131	129	120	119	116	
		20d	20d	181	170	163	161	157	151	149	139	137	135	
	0.177	20d	30d	186	176	170	168	163	157	155	145	143	140	
		20d	30d	191	177	170	168	163	157	155	145	143	140	
	1-1/4	0.148	10d	20d	132	123	118	116	113	109	108	100	99	97
			16d	40d	159	147	141	139	135	131	129	120	119	116
0.177		20d	20d	183	170	163	161	157	151	149	139	137	135	
		20d	30d	191	177	170	168	163	157	155	145	143	140	

1. Tabulated lateral design values, Z, shall be multiplied by all applicable adjustment factors (see Table 10.3.1)  
 2. Tabulated lateral design values, Z, are for common, box, or sinker steel wire nails (see Appendix Table L.4) inserted in side grain with nail axis perpendicular to wood fibers; nail penetration, p, into the main member equal to 10D and nail bending yield strengths, F<sub>b</sub>, of 100,000 psi for 0.099" ≤ D ≤ 0.142", 90,000 psi for 0.142" < D ≤ 0.177", 80,000 psi for 0.177" < D ≤ 0.236", and 70,000 psi for 0.236" < D ≤ 0.273".  
 3. Where the nail or spike penetration, p, is less than 10D but not less than 6D, tabulated lateral design values, Z, shall be multiplied by p/10D or lateral design values shall be calculated using the provisions of 11.3 for the reduced penetration  
 4. Nail length is insufficient to provide 10D penetration. Tabulated lateral design values, Z, shall be adjusted per footnote 3.  
 5. Tabulated lateral design values, Z, shall be permitted to apply for greater side member thickness when adjusted per footnote 3.



**Table 11R COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**

with wood structural panel side members with an effective  $G=0.42$   
 (tabulated lateral design values are calculated based on an assumed nail penetration,  $p$ , into the main member equal to 10D)

Side Member Thickness in.	D Nail Diameter in.	Common Wire Nail		G=0.67 Red Oak	G=0.55 Mixed Maple Southern Pine	G=0.5 Douglas Fir-Larch	G=0.49 Douglas Fir-Larch (N)	G=0.46 Douglas Fir(S) Hem-Fir(N)	G=0.43 Hem-Fir	G=0.42 Spruce-Pine-Fir	G=0.37 Redwood (open grain)	G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods	G=0.35 Northern Species			
		Box Nail	Sinker Nail													
3/8	0.099 0.113 0.120 0.128 0.131 0.135 0.148 0.148	6d	7d	41	39	37	37	36	35	35	33	33	32			
			8d	52	49	48	47	46	45	45	42	42	41			
		8d	10d	68	65	63	63	62	61	60	59	58	57	56		
			12d	69	66	64	64	63	62	61	60	59	58	57		
		10d	16d	73	69	67	66	65	63	63	62	62	60	59		
			20d	84	79	76	76	74	72	71	71	67	66	65		
		7/16	0.099 0.113 0.120 0.128 0.131 0.135 0.148 0.148	6d	7d	42	40	39	38	38	37	36	35	34	34	
					8d	53	50	49	48	46	46	43	43	42	42	
				8d	10d	69	66	64	64	63	62	61	60	59	58	57
					12d	70	66	64	64	62	62	60	60	57	56	55
10d	16d			74	70	68	67	66	64	64	63	63	60	59		
	20d			84	80	77	76	75	73	73	72	68	67	66		
16d	40d			100	95	92	91	89	86	85	85	81	80	78		
15/32	0.099 0.113 0.120 0.128 0.131 0.135 0.148 0.148			6d	7d	43	41	40	39	39	38	37	35	35	35	
					8d	54	51	50	49	48	47	47	44	44	43	
		8d	10d	60	57	55	55	54	52	52	49	49	48	48		
			12d	68	64	62	62	60	59	59	56	55	54	54		
		10d	16d	70	67	65	64	63	61	61	57	57	56	56		
			20d	75	71	68	68	66	65	64	61	60	59	58		
		16d	40d	85	80	78	77	76	73	73	72	69	68	67		
		19/32	0.099 0.113 0.120 0.128 0.131 0.135 0.148 0.162 0.177 0.192	6d	7d	47	45	44	43	43	41	41	39	39	38	
					8d	58	55	54	53	52	51	50	48	48	47	
8d	10d			64	61	59	59	58	56	56	53	52	52	52		
	12d			71	68	66	65	64	62	62	59	58	57	57		
10d	16d			74	70	68	68	67	65	64	61	61	60	60		
	20d			78	74	72	71	70	68	68	64	64	63	63		
16d	40d			88	84	81	81	79	77	76	72	72	71	71		
20d	20d			118	112	109	108	105	102	102	101	96	95	94		
	30d			123	116	112	112	109	106	106	105	100	99	97		
23/32	0.099 0.113 0.120 0.128 0.131 0.135 0.148 0.162 0.177 0.192	6d	7d	52	50	48	48	47	46	46	44	43	43			
			8d	63	60	58	58	57	56	55	53	52	52			
		8d	10d	69	66	64	64	62	61	60	58	57	56	56		
			12d	76	73	71	70	69	67	67	63	63	62	62		
		10d	16d	75	75	73	73	71	70	70	67	66	65	64		
			20d	83	78	77	76	75	73	73	72	69	68	67		
		16d	40d	93	89	86	85	84	82	81	77	77	76	76		
		20d	20d	109	103	100	99	98	95	94	90	89	88	87		
			30d	122	116	113	112	110	107	106	101	100	99	98		
30d																
1	0.099 <sup>3</sup> 0.113 <sup>3</sup> 0.120 <sup>3</sup> 0.128 0.131 0.135 0.148 0.162 0.177 0.192	6d	7d	56	53	51	50	49	48	47	44	44	43			
			8d	73	68	66	66	64	62	61	58	57	56			
		8d	10d	82	77	75	74	72	70	69	65	64	63	63		
			12d	81	87	85	84	82	80	78	74	73	72	72		
		10d	16d	83	89	87	87	85	83	82	77	77	75	75		
			20d	97	93	91	90	89	87	86	82	81	80	80		
		16d	40d	109	104	101	101	99	97	97	90	91	91	90		
		20d	20d	124	118	115	115	113	110	109	104	104	103	102		
			30d	137	131	128	127	125	122	121	115	114	114	112		
30d																
1-1/8	0.128 <sup>3</sup> 0.131 <sup>3</sup> 0.135 <sup>3</sup> 0.148 <sup>3</sup> 0.162 0.177 0.192	8d	10d	93	88	85	84	82	80	79	74	73	72			
			12d	98	92	89	88	86	83	82	77	77	75			
		10d	16d	104	99	94	94	91	89	88	82	81	80	80		
			20d	117	111	108	107	104	101	100	94	93	91			
		16d	40d	132	127	123	123	120	118	117	111	110	109			
		20d	20d	146	139	136	135	132	129	128	122	121	121			
			30d	150	143	139	138	136	133	132	126	125	123			
		30d														
1-1/4	0.148 0.182 0.177 0.192	10d	20d	118	111	108	107	104	101	100	94	93	91			
			16d	141	134	129	128	125	121	120	112	111	109			
		20d		155	148	144	143	141	138	136	130	129	128			
			30d	159	152	148	147	144	141	140	134	133	131			



1. Tabulated lateral design values, Z, shall be multiplied by all applicable adjustment factors (see Table 10.3.1).
2. Tabulated lateral design values, Z, are for common, box, or sinker steel wire nails (see Appendix Table L4) inserted in side grain with nail axis perpendicular to wood fibers; nail penetration, p, into the main member equal to 10D and nail bending yield strengths,  $F_{bn}$ , of 100,000 psi for  $0.099 \leq D \leq 0.142$ , 90,000 psi for  $0.142 < D \leq 0.177$ , 80,000 psi for  $0.177 < D \leq 0.236$ , and 70,000 psi for  $0.236 < D \leq 0.273$ .
3. Where the nail or spike penetration, p, is less than 10D but not less than 6D, tabulated lateral design values, Z, shall be multiplied by p/10D or lateral design values shall be calculated using the provisions of 11.3 for the reduced penetration.
4. Nail length is insufficient to provide 10D penetration. Tabulated lateral design values, Z, shall be adjusted per footnote 3.
5. Tabulated lateral design values, Z, shall be permitted to apply for greater side member thickness when adjusted per footnote 3.