

HIGH BOND NAIL

EXCELLENT PERFORMANCE

The new LBA nails have shear strength values among the highest on the market and make it possible to certify characteristic nail strengths that more closely approximate actual experimental strengths.

CERTIFIED ON CLT AND LVL

Tested and certified values for plates on CLT substrates. Its use is also certified on LVL.

LBA BINDED

The nail is also available in a bound version with the same ETA certification and therefore the same high performance.

STAINLESS STEEL VERSION

The nails are also available with the same certification from ETA in A4/AISI316 stainless steel for outdoor applications, with very high strength values.



DIAMETER [in] 0.12 **0.16** 0.24 0.48

LENGTH [in] 1 **1 9/16** 4 8

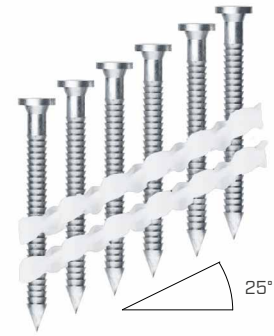
MATERIAL

Zn
ELECTRO
PLATED electrogalvanized carbon steel

EC1 DRY C2 T2

A4
AISI 316 A4 | AISI316 austenitic stainless steel (CRC III)

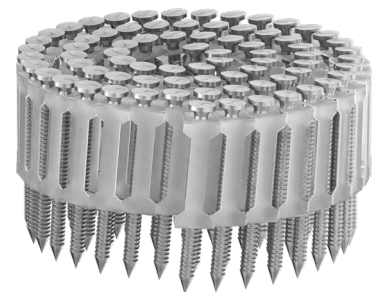
EC1 EC2 EC3 WET C5 T5



LBA 25 PLA



LBA 34 PLA

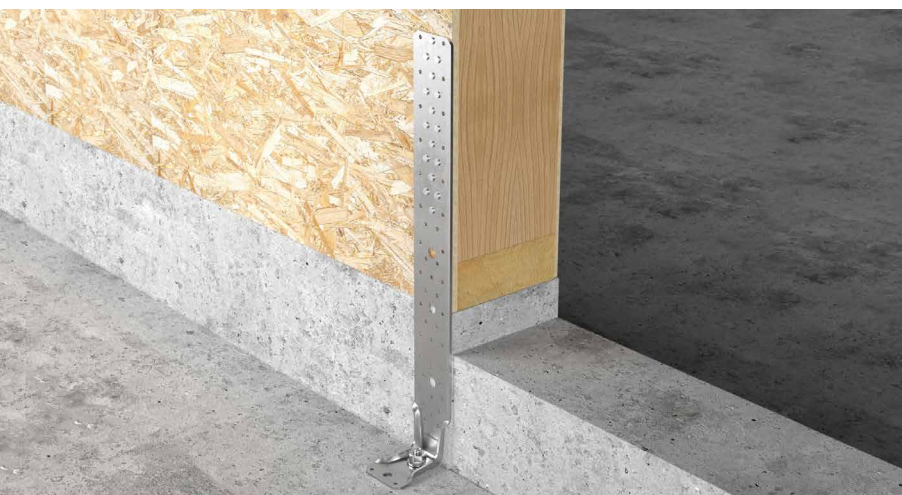
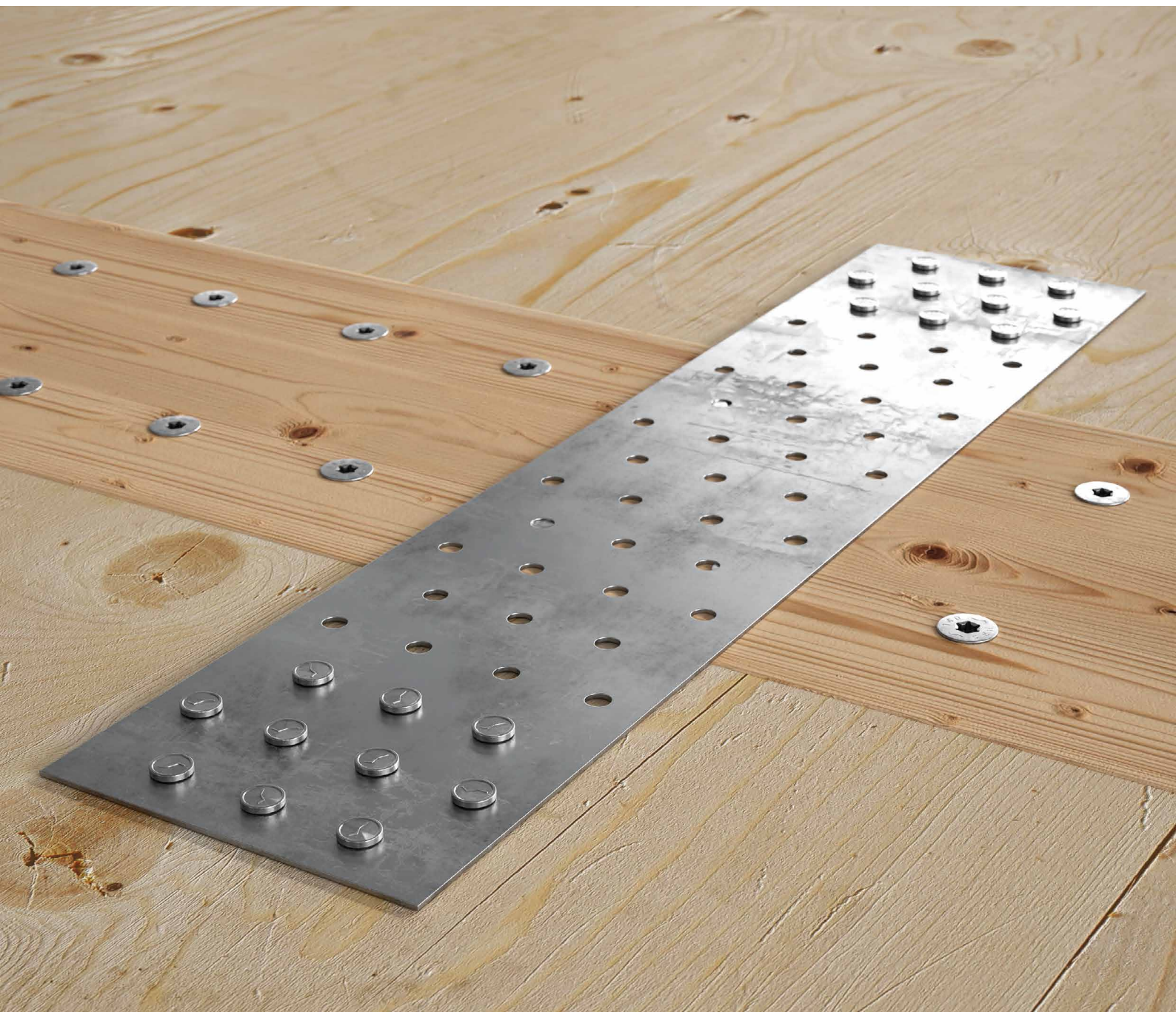


LBA COIL



FIELDS OF USE

- timber based panels
- fibreboard and MDF panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT, LVL



CAPACITY DESIGN

The strength values are much closer to the actual experimental strengths, so capacity design can be performed more reliably.

WKR

Values also tested, certified and calculated for fastening standard Rothoblaas plates. Using the nailer speeds up and facilitates installation.

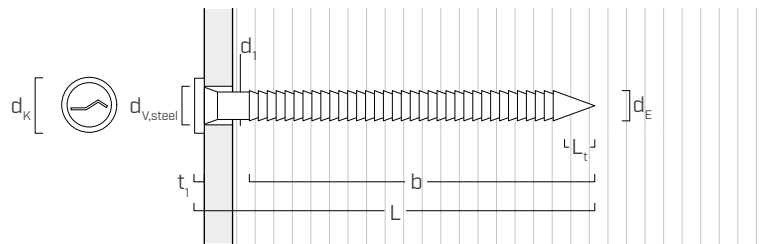


Use with NINO angle brackets allows for some of the most versatile applications: even for beam-to-beam joints.



LBA achieves the highest performance together with the WKR angle brackets with the specific strength values on CLT.

■ GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

			LBA		LBAI
Nominal diameter	d_1	[in] ⁽¹⁾	0.16	0.24	0.16
Shank diameter	d_1	[mm]	4	6	4
	d_1	[in]	0.157	0.236	0.157
Head diameter	d_K	[in]	0.315	0.472	0.315
External diameter	d_E	[in]	0.173	0.260	0.173
Head thickness	t_1	[in]	0.193	0.276	0.193
Tip Length	L_t	[in]	0.173	0.236	0.173
Hole diameter on steel plate	$d_{V,steel}$	[in]	3/16 - 7/32	1/4 - 5/16	3/16 - 7/32
Pre-drilling hole diameter ⁽²⁾	$d_{V,G \leq 0.55}$	[in]	1/8	5/32	1/8
Pre-drilling hole diameter ⁽³⁾	$d_{V,G > 0.55}$	[in]	9/64	13/64	9/64

⁽¹⁾The nominal diameter of the screw is converted into imperial units and rounded up to the nearest decimal point.

⁽²⁾Pre-drilling applies to timber with $G \leq 0.55$ (optional).

⁽³⁾Pre-drilling applies to timber with $G > 0.55$ (required).

CHARACTERISTIC MECHANICAL PARAMETERS

			LBA		LBAI
Nominal diameter	d_1	[in]	0.16	0.24	0.16
Bending yield strength (specified) ⁽⁴⁾	$F_{y,b}$	[psi]	94000	85000	107000

⁽⁴⁾Values obtained from test according to ASTM F1575.

			LBA		LBAI
Nominal diameter	d_1	[in]	0.16	0.24	0.16
Withdrawal	$W_{90}^{(5)}$	[lbf/in]	G = 0.35	35	53
			G = 0.42	51	76
			G = 0.49	69	104
			G = 0.55	87	131
minimum embedded length		[in]	15/16	1 7/16	15/16

⁽⁵⁾ Values according to NDS - deformed shank nails.

CODES AND DIMENSIONS

LOOSE NAILS

LBA

Zn
ELECTRO
PLATED

d ₁ [mm] [in]	CODE	L		b		pcs
		[mm]	[in]	[mm]	[in]	
4 0.16	LBA440	40	1 9/16	30	1 3/16	250
	LBA450	50	1 15/16	40	1 9/16	250
	LBA460	60	2 3/8	50	1 15/16	250
	LBA475	75	2 15/16	65	2 9/16	250
6 0.24	LBA4100	100	4	85	3 3/8	250
	LBA660	60	2 3/8	50	1 15/16	250
	LBA680	80	3 1/8	70	2 3/4	250
	LBA6100	100	4	85	3 3/8	250

LBAI A4 | AISI316

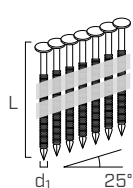
A4
AISI 316

d ₁ [mm] [in]	CODE	L		b		pcs
		[mm]	[in]	[mm]	[in]	
4 0.16	LBA450	50	1 15/16	40	1 9/16	250

STRIP-BOUND NAILS

LBA 25 PLA - plastic stick binding 25°

Zn
ELECTRO
PLATED

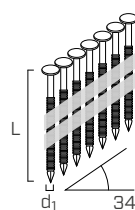


d ₁ [mm] [in]	CODE	L		b		pcs
		[mm]	[in]	[mm]	[in]	
4 0.16	LBA25PLA440	40	1 9/16	30	1 3/16	2000
	LBA25PLA450	50	1 15/16	40	1 9/16	2000
	LBA25PLA460	60	2 3/8	50	1 15/16	2000

Compatible with Anker 25° nailgun HH3522.

LBA 34 PLA - plastic stick binding 34°

Zn
ELECTRO
PLATED



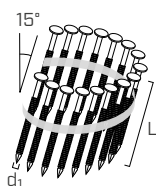
d ₁ [mm] [in]	CODE	L		b		pcs
		[mm]	[in]	[mm]	[in]	
4 0.16	LBA34PLA440	40	1 9/16	30	1 3/16	2000
	LBA34PLA450	50	1 15/16	40	1 9/16	2000
	LBA34PLA460	60	2 3/8	50	1 15/16	2000

Compatible with 34° strip magazine nailgun ATEU0116 and gas nailgun HH12100700.

ROLL-BOUND NAILS

LBA COIL - 15° plastic roll binding

Zn
ELECTRO
PLATED



d ₁ [mm] [in]	CODE	L		b		pcs
		[mm]	[in]	[mm]	[in]	
4 0.16	LBACOIL440	40	1 9/16	30	1 3/16	1600
	LBACOIL450	50	1 15/16	40	1 9/16	1600
	LBACOIL460	60	2 3/8	50	1 15/16	1600

Compatible with nailgun TJ100091.

NOTE: LBA, LBA 25 PLA, LBA 34 PLA and LBA COIL available in hot-dip galvanised version on request.

RELATED PRODUCTS

CODE	description	d ₁ NAIL [in]	L _{NAIL} [in]	pcs
HH3731	palm nailer	0.16 - 0.24	-	1
HH3522	Anker 25° nailgun	0.16	1 9/16 - 2 3/8	1
ATEU0116	strip magazine nailgun 34°	0.16	1 9/16 - 2 3/8	1
HH12100700	Anker 34° gas nailgun	0.16	1 9/16 - 2 3/8	1
TJ100091	Anker coil nailgun 15°	0.16	1 9/16 - 2 3/8	1

For more information about nailguns see page 434.



HH3731



HH3522



ATEU0116



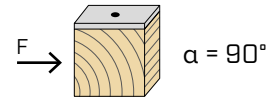
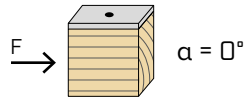
HH12100700



TJ100091

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

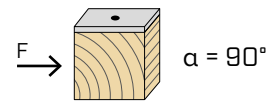
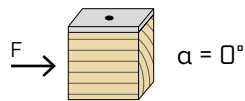
 screws inserted **WITHOUT** pre-drilled hole **G < 0.50**



d_1	[in]	0.16	0.24
	[mm]	4	6
a_1	[in]	15·d	2 3/8
a_2	[in]	5·d	13/16
$a_{3,t}$	[in]	15·d	2 3/8
$a_{3,c}$	[in]	10·d	1 9/16
$a_{4,t}$	[in]	10·d	1 9/16
$a_{4,c}$	[in]	5·d	13/16

	0.16	0.24
	4	6
10·d	1 9/16	2 3/8
5·d	13/16	1 3/16
15·d	2 3/8	3 1/2
10·d	1 9/16	2 3/8
10·d	1 9/16	2 3/8
5·d	13/16	1 3/16

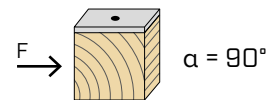
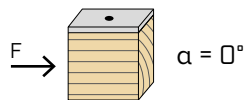
 screws inserted **WITHOUT** pre-drilled hole **G > 0.50**



d_1	[in]	0.16	0.24
	[mm]	4	6
a_1	[in]	15·d	2 3/8
a_2	[in]	7·d	1 1/8
$a_{3,t}$	[in]	20·d	3 1/8
$a_{3,c}$	[in]	15·d	2 3/8
$a_{4,t}$	[in]	12·d	1 7/8
$a_{4,c}$	[in]	7·d	1 1/8

	0.16	0.24
	4	6
10·d	1 9/16	2 3/8
7·d	1 1/8	1 5/8
20·d	3 1/8	4 3/4
15·d	2 3/8	3 1/2
12·d	1 7/8	2 13/16
7·d	1 1/8	1 5/8

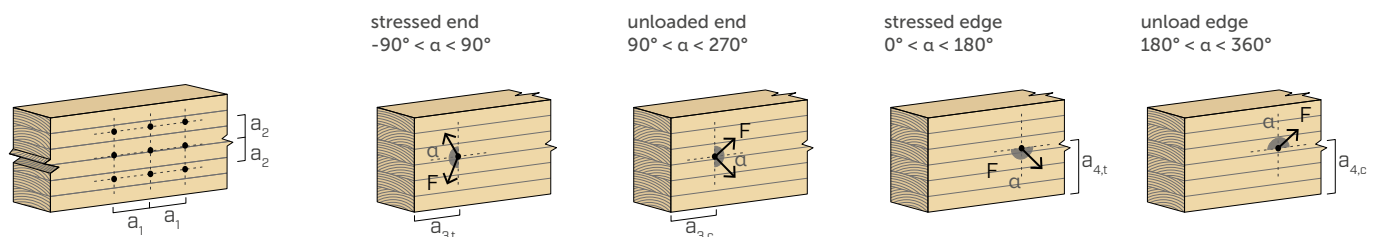
 screws inserted **WITH** pre-drilled hole



d_1	[in]	0.16	0.24
	[mm]	4	6
a_1	[in]	10·d	1 9/16
a_2	[in]	4·d	5/8
$a_{3,t}$	[in]	12·d	1 7/8
$a_{3,c}$	[in]	7·d	1 1/8
$a_{4,t}$	[in]	7·d	1 1/8
$a_{4,c}$	[in]	3·d	1/2

	0.16	0.24
	4	6
5·d	13/16	1 3/16
4·d	5/8	15/16
12·d	1 7/8	2 13/16
7·d	1 1/8	1 5/8
7·d	1 1/8	1 5/8
3·d	1/2	11/16

α = load-to-grain angle
 d_1 = nominal diameter of the screw

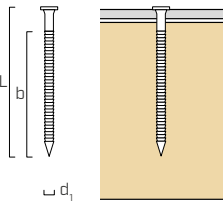
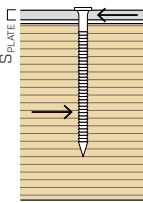
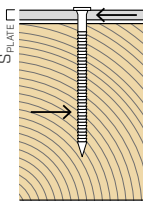


NOTE

- The minimum spacing and distances comply with Table 8 of ESR-4645, where d refers to the nominal diameter of the screw;
- Wood member stresses must be checked in accordance with the corresponding Sections of the NDS; end distances, edge distances and fastener spacing may need to be increased accordingly.

REFERENCE LATERAL DESIGN VALUES (Z) | STEEL-TO-WOOD

LBA Ø0.16 in - Ø0.24 in

geometry				$Z_{ }^{(1)}$					$Z_{\perp}^{(2)}$				
													
d_1	L	b		S_{PLATE}	0.35	0.42	0.49	0.55	S_{PLATE}	0.35	0.42	0.49	0.55
[mm]	[mm]	[in]	[in]	[in]	[lb f]	[lb f]	[lb f]	[lb f]	[in]	[lb f]	[lb f]	[lb f]	[lb f]
4 0.16	40	1 9/16	1 3/16	1/8	124	164	186	204	1/8	124	164	186	204
	50	1 15/16	1 9/16		141	164	186	204		141	164	186	204
	60	2 3/8	1 15/16		141	164	186	204		141	164	186	204
	75	2 15/16	2 9/16		141	164	186	204		141	164	186	204
	100	4	3 3/8		141	164	186	204		141	164	186	204
6 0.24	60	2 3/8	1 15/16	1/8	237	258	276	290	1/8	139	177	197	212
	80	3 1/8	2 3/4		237	258	276	290		158	178	197	212
	100	4	3 3/8		237	258	276	290		158	178	197	212
4 0.16	40	1 9/16	1 3/16	1/4	134	172	215	243	1/4	134	172	215	243
	50	1 15/16	1 9/16		156	192	219	243		156	192	219	243
	60	2 3/8	1 15/16		163	192	219	243		163	192	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	1/4	276	318	353	370	1/4	163	198	235	269
	80	3 1/8	2 3/4		305	330	353	370		199	230	253	272
	100	4	3 3/8		305	330	353	370		202	230	253	272
4 0.16	40	1 9/16	1 3/16	3/8	128	163	202	239	3/8	128	163	202	239
	50	1 15/16	1 9/16		148	192	219	243		148	192	219	243
	60	2 3/8	1 15/16		163	192	219	243		163	192	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	3/8	299	336	361	381	3/8	174	213	255	277
	80	3 1/8	2 3/4		308	336	361	381		202	230	256	277
	100	4	3 3/8		308	336	361	381		202	230	256	277
4 0.16	40	1 9/16	1 3/16	1/2	123	154	189	222	1/2	123	154	189	222
	50	1 15/16	1 9/16		141	184	219	243		141	184	219	243
	60	2 3/8	1 15/16		163	192	219	243		163	192	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	1/2	286	331	361	381	1/2	168	205	244	277
	80	3 1/8	2 3/4		308	336	361	381		202	230	256	277
	100	4	3 3/8		308	336	361	381		202	230	256	277
4 0.16	40	1 9/16	1 3/16	5/8	119	147	177	206	5/8	119	147	177	206
	50	1 15/16	1 9/16		135	174	217	243		135	174	217	243
	60	2 3/8	1 15/16		157	192	219	243		157	192	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	5/8	274	316	357	381	5/8	163	197	234	266
	80	3 1/8	2 3/4		308	336	361	381		202	230	256	277
	100	4	3 3/8		308	336	361	381		202	230	256	277
4 0.16	40	1 9/16	1 3/16	3/4	116	141	167	192	3/4	116	141	167	192
	50	1 15/16	1 9/16		129	164	204	241		129	164	204	241
	60	2 3/8	1 15/16		150	192	219	243		150	192	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	3/4	263	301	339	372	3/4	158	190	223	254
	80	3 1/8	2 3/4		308	336	361	381		196	230	256	277
	100	4	3 3/8		308	336	361	381		202	230	256	277
4 0.16	40	1 9/16	1 3/16	7/8	115	137	160	181	7/8	115	137	160	181
	50	1 15/16	1 9/16		124	155	191	224		124	155	191	224
	60	2 3/8	1 15/16		143	185	219	243		143	185	219	243
	75	2 15/16	2 9/16		163	192	219	243		163	192	219	243
	100	4	3 3/8		163	192	219	243		163	192	219	243
6 0.24	60	2 3/8	1 15/16	7/8	252	287	323	352	7/8	153	183	214	242
	80	3 1/8	2 3/4		308	336	361	381		189	230	256	277
	100	4	3 3/8		308	336	361	381		202	230	256	277

(1) Main member loaded parallel to the grain.

(2) Main member loaded perpendicular to the grain.

REFERENCE LATERAL DESIGN VALUES (Z) | STEEL-TO-WOOD

LBAI Ø0.16 in

geometry				$Z_{ }^{(1)}$					$Z_{\perp}^{(2)}$				
d_1	L	b		S_{PLATE}	0.35	0.42	0.49	0.55	S_{PLATE}	0.35	0.42	0.49	0.55
[mm] [in]	[mm] [in]	[in]	[in]	[in]	[lb f]	[lb f]	[lb f]	[lb f]	[in]	[lb f]	[lb f]	[lb f]	[lb f]
4 0.16	50	1 15/16	1 9/16	1/8	147	171	194	213	1/8	147	171	194	213
	50	1 15/16	1 9/16	1/4	160	204	234	259	1/4	160	204	234	259
	50	1 15/16	1 9/16	3/8	153	199	234	259	3/8	153	199	234	259
	50	1 15/16	1 9/16	1/2	146	188	234	259	1/2	146	188	234	259
	50	1 15/16	1 9/16	5/8	140	179	223	259	5/8	140	179	223	259
	50	1 15/16	1 9/16	3/4	134	170	209	247	3/4	134	170	209	247
	50	1 15/16	1 9/16	7/8	130	161	197	231	7/8	130	161	197	231

⁽¹⁾ Main member loaded parallel to the grain.

⁽²⁾ Main member loaded perpendicular to the grain.

REFERENCE LATERAL DESIGN VALUES (Z) | WOOD-TO-WOOD

LBA Ø0.16 in - Ø0.24 in

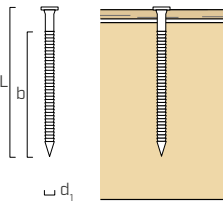
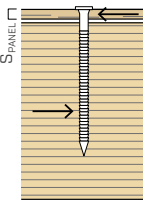
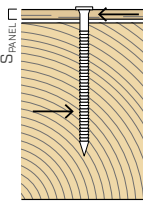
geometry					$Z_{ }$				$Z_{\perp/ }$				$Z_{\perp}$			
d_1	L	b	A		G				G				G			
[mm] [in]	[mm] [in]	[in]	[in]	[in]	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
4 0.16	40	1 9/16	1 3/16	13/16	58	81	108	134	58	81	108	134	58	81	108	134
	50	1 15/16	1 9/16	1	73	102	136	165	73	102	136	165	73	102	136	165
	60	2 3/8	1 15/16	1 3/16	88	124	158	177	88	124	158	177	88	124	158	177
	75	2 15/16	2 9/16	1 1/2	110	138	159	177	110	138	159	177	110	138	159	177
	100	4	3 3/8	1 15/16	117	138	159	177	117	138	159	177	117	138	159	177
6 0.24	60	2 3/8	1 15/16	1 3/16	132	158	185	207	86	107	129	149	70	92	114	135
	80	3 1/8	2 3/4	1 9/16	178	213	249	279	117	145	175	202	95	123	154	182
	100	4	3 3/8	1 15/16	222	244	263	279	148	179	197	211	119	155	185	201

LBAI Ø0.16 in

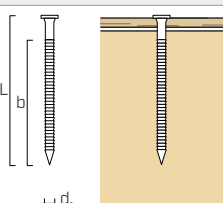
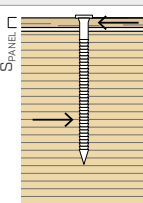
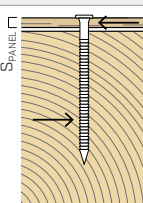
geometry					$Z_{ }$				$Z_{\perp/ }$				$Z_{\perp}$			
d_1	L	b	A		G				G				G			
[mm] [in]	[mm] [in]	[in]	[in]	[in]	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
4 0.16	50	1 15/16	1 9/16	1	73	102	136	168	73	102	136	168	73	102	136	168

REFERENCE LATERAL DESIGN VALUES (Z) | PANEL-TO-WOOD

LBA Ø0.16 in - Ø0.24 in

geometry				$Z_{ }^{(1)}$					$Z_{\perp}^{(2)}$				
													
d_1	L		b	S_{PANEL}	0.35	0.42	0.49	0.55	S_{PANEL}	0.35	0.42	0.49	0.55
[mm] [in]	[mm]	[in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[lbf]	[lbf]	[lbf]	[lbf]
4 0.16	40	1 9/16	1 3/16	1/2	69	88	105	109	1/2	69	88	105	109
	50	1 15/16	1 9/16		91	99	105	109		91	99	105	109
	60	2 3/8	1 15/16		91	99	105	109		91	99	105	109
	75	2 15/16	2 9/16		91	99	105	109		91	99	105	109
	100	4	3 3/8		91	99	105	109		91	99	105	109
6 0.24	60	2 3/8	1 15/16	1/2	109	109	109	109	1/2	87	87	87	87
	80	3 1/8	2 3/4		109	109	109	109		87	87	87	87
	100	4	3 3/8		109	109	109	109		87	87	87	87
4 0.16	40	1 9/16	1 3/16	3/4	69	81	94	106	3/4	69	81	94	106
	50	1 15/16	1 9/16		85	106	113	117		85	106	113	117
	60	2 3/8	1 15/16		99	107	113	117		99	107	113	117
	75	2 15/16	2 9/16		99	107	113	117		99	107	113	117
	100	4	3 3/8		99	107	113	117		99	107	113	117
6 0.24	60	2 3/8	1 15/16	3/4	138	159	163	163	3/4	82	99	118	129
	80	3 1/8	2 3/4		153	159	163	163		111	119	125	129
	100	4	3 3/8		153	159	163	163		111	119	125	129
4 0.16	40	1 9/16	1 3/16	1	82	88	95	101	1	82	88	95	101
	50	1 15/16	1 9/16		89	102	117	130		89	102	117	130
	60	2 3/8	1 15/16		103	120	126	130		103	120	126	130
	75	2 15/16	2 9/16		112	120	126	130		112	120	126	130
	100	4	3 3/8		112	120	126	130		112	120	126	130
6 0.24	60	2 3/8	1 15/16	1	125	140	155	167	1	79	92	105	117
	80	3 1/8	2 3/4		161	167	171	175		111	126	131	135
	100	4	3 3/8		161	167	171	175		118	126	131	135

LBAI Ø0.16 in

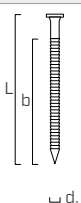
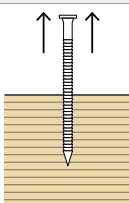
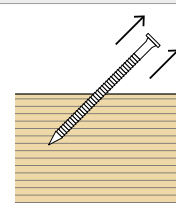
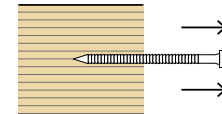
geometry				$Z_{ }^{(1)}$					$Z_{\perp}^{(2)}$				
													
d_1	L		b	S_{PANEL}	0.35	0.42	0.49	0.55	S_{PANEL}	0.35	0.42	0.49	0.55
[mm] [in]	[mm]	[in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[lbf]	[lbf]	[lbf]	[lbf]
4 0.16	50	1 15/16	1 9/16	1/2	91	99	105	109	1/2	91	99	105	109
4 0.16	50	1 15/16	1 9/16	3/4	85	106	113	117	3/4	85	106	113	117
4 0.16	50	1 15/16	1 9/16	1	89	102	117	130	1	89	102	117	130

(1) Main member loaded parallel to the grain.

(2) Main member loaded perpendicular to the grain.

NOTES and GENERAL PRINCIPLES on page 296.

THREAD WITHDRAWAL (W) | WOOD

geometry				thread withdrawal $\alpha = 90^\circ$				thread withdrawal $\alpha = 45^\circ$				thread withdrawal $\alpha = 0^\circ$			
															
d_1	L	b		G				G				G			
				0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55	0.35	0.42	0.49	0.55
[mm] [in]	[mm] [in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
4 0.16	40	1 9/16 ⁽¹⁾	1 3/16	36	52	71	89	33	47	64	81	11	16	21	27
	50	1 15/16	1 9/16	50	72	98	123	46	66	89	112	15	22	29	37
	60	2 3/8	1 15/16	64	92	125	158	58	84	114	144	19	28	38	47
	75	2 15/16	2 9/16	85	122	166	209	77	111	151	190	25	37	50	63
	100	4	3 3/8	113	162	221	278	102	147	201	253	34	49	66	83
6 0.24	60	2 3/8 ⁽¹⁾	1 15/16	92	132	180	226	83	120	164	206	28	40	54	68
	80	3 1/8	2 3/4	133	192	261	329	121	175	238	300	40	58	78	99
	100	4	3 3/8	165	237	323	406	150	216	294	370	49	71	97	122

⁽¹⁾ The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle $0^\circ \leq \alpha < 90^\circ$ to the grain).

GENERAL PRINCIPLES

- Tabulated values comply with NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION in accordance with ESR-4645.
- To determine allowable loads for use with ASD, design loads for use with LRFD or both, tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners.
- As part of the connection design, the structural wood members, the steel plates must be sized and verified in accordance with the corresponding Section of the NDS and must be done separately by the designer.
- Connections with multiple screws must be designed in accordance with the corresponding Sections of the NDS and ESR-4645.
- LBA and LBAI nails must be installed and used in dry in-service conditions in accordance with the NDS (wet service factor for connection CM is 1.0).
- LBA and LBAI nails must be positioned in accordance with the minimum distances.

REFERENCE LATERAL DESIGN VALUES

- Tabulated values are determined from the yield model equations in the corresponding Section of the NDS.
- Unless otherwise noted, the threaded part of the screw is fully inserted in the main member.
- The nail penetration into the main member is minimum 6 times the outer thread diameter unless otherwise noted.
- The reference lateral design values may be determined for other connection configurations in accordance with the corresponding Section of NDS and ESR-4645.
- The reference lateral design values are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.

WOOD-TO-WOOD

- The wood main member thickness must be greater than the screw length minus the thickness of the wood side member.
- The tabulated lateral design values are based on both wood members having the same specific gravity G.

STEEL-TO-WOOD

- The steel side member must have a minimum tensile strength equal to 58 ksi (400 MPa) and comply with the minimum requirements of ASTM A36.
- The wood main member thickness must be greater than the screw length minus the thickness of the steel side member.
- In case of steel-to-wood connection with a thick plate, it is necessary to assess the effects of wood deformations and install the connectors according to the assembly instructions.

PANEL-TO-WOOD

- The wood main member thickness must be greater than the nail length minus the thickness of the wood side member.
- The bearing strength of the panel is conservatively considered as 3350 psi according to NDS.

REFERENCE WITHDRAWAL DESIGN VALUES

- The reference withdrawal design values (W_{ref}) expressed in pounds-force per inch of thread penetration into the main member for nails installed at an angle of 90° to the grain are calculated according to NDS2024 Withdrawal for deformed shank nails 12.2.3.2.
- The values for screws installed at an angle α to the grain are determined by multiplying the reference withdrawal design values with the effective thread penetration L_{eff} of the screw in the wood member and with the factor k_α :

$$W_\alpha = W_{ref} \cdot k_\alpha \cdot L_{eff}$$

Where:

- W_{ref} is the reference withdrawal design value for screws installed at an angle of 90° to the grain, as shown in the table on the left;
- k_α factor is calculated as:

$$k_\alpha = \begin{cases} 35^\circ < \alpha \leq 90^\circ & \frac{1}{1.2 \cdot \cos^2(\alpha) + \sin^2(\alpha)} \\ 0^\circ \leq \alpha \leq 35^\circ & \frac{0.3 + 0.7 \cdot \alpha}{45} \end{cases}$$

- α is the angle between the grain direction and screw axis.

Tabulated values at page 296 are valid for L_{eff} equal to the screw thread length b minus the tip length L_t and $k_\alpha = 1$ for $\alpha = 90^\circ$, $k_\alpha = 0.91$ for $\alpha = 45^\circ$, $k_\alpha = 0.3$ for $\alpha = 0^\circ$.

- The minimum embedded thread length is 6 times the outer thread diameter for screws installed at 90° to the grain, unless otherwise noted.
- The minimum embedded thread length for screws installed at an angle $0^\circ \leq \alpha < 90^\circ$ to the grain is 8 times the outer thread diameter, unless otherwise noted.
- At least four screws must be used in a connection with screws installed in the wood member with an angle between the grain direction and screw axis $\alpha \leq 15^\circ$.

The reference withdrawal design values must be inferior to f_{tens} of the nail.