SBD

SELF-DRILLING DOWEL

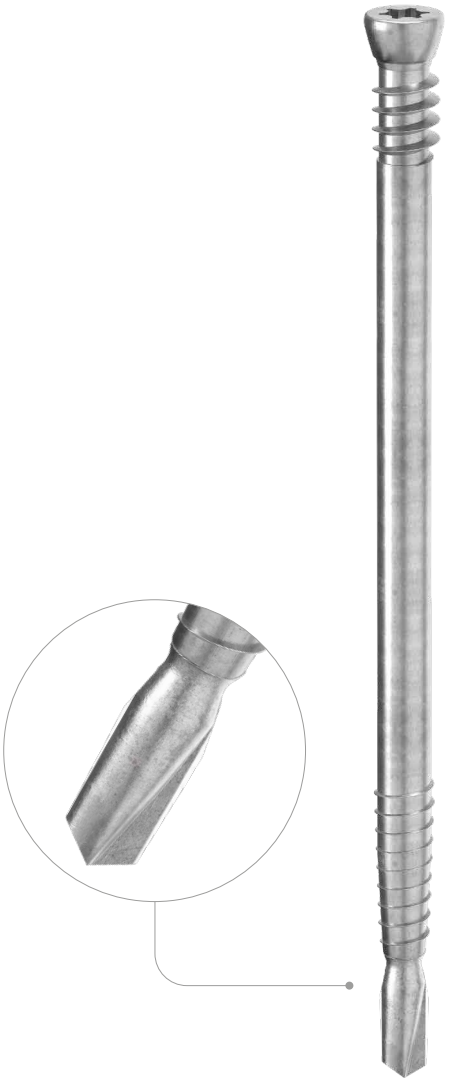
CE
EN 14592

TAPERED TIP
The new tapered self-perforating tip minimises insertion times in timber-to-metal connection systems and guarantees applications in hard-to-reach positions (reduced application force).

GREATER STRENGTH
Higher shear strengths than the previous version.
The 0.30 inch (7,5 mm) diameter ensures higher shear strengths than other solutions on the market and enables optimisation of the number of fasteners.

DOUBLE THREAD
The thread close to the tip (b_1) facilitates screwing. The longer under-head thread (b_2) allows quick and precise closing of the joint.

CYLINDRICAL HEAD
It allows the dowel to penetrate beyond the surface of the timber substrate. It ensures an optimal appearance and meets fire-strength requisites.



MY PROJECT SOFTWARE | VIDEO

BIT INCLUDED

DIAMETER [in]	0.14 — **0.30** — 0.32
LENGTH [in]	1 — **2 3/16** — **9 1/4** — 9 1/2
EXPOSURE CONDITION	EC1 DRY
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn ELECTRO PLATED electrogalvanized carbon steel

VIDEO
Scan the QR Code and watch the video on our YouTube channel

FIELDS OF USE

Self-drilling system for concealed timber-to. steel joints.
It can be used with screw guns running at 600-2100 rpm, minimum applied force 55 lbs | 25 kg, with:

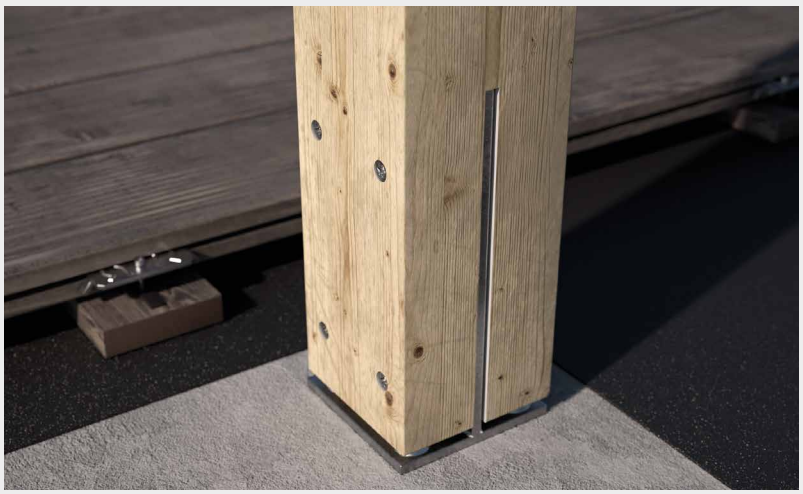
- steel S235 ≤ 3/8"
- steel S275 ≤ 3/8"
- steel S355 ≤ 3/8"
- ALUMINI, ALUMIDI and ALUMAXI brackets

MOMENT RESTORING

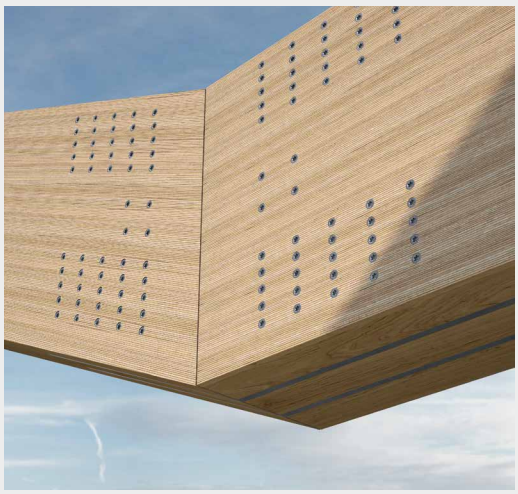
It restores shear and moment forces in concealed centreline joints of large beams.

EXCEPTIONAL SPEED

The only dowel that drills a 3/16" thick S355 plate in 20 seconds (horizontal application with an applied force of 55 lbs | 25 kg).
No self-drilling pin exceeds the application speed of the SBD with its new tip.



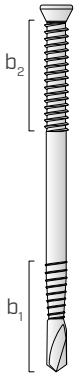
Fastening of Rothoblaas pillar-holder with internal knife plate F70.



Rigid "knee" joint with double internal plate (LVL).

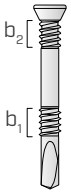
CODES AND DIMENSIONS

SBD L ≥ 3 3/4"



d_1 [mm] [in]	CODE	L [mm]	L [in]	b_1 [mm]	b_1 [in]	b_2 [mm]	b_2 [in]	pcs
7,5 **0.30** TX 40	**SBD7595**	95	3 3/4	40	1 9/16	10	3/8	50
	SBD75115	115	4 1/2	40	1 9/16	10	3/8	50
	SBD75135	135	5 5/16	40	1 9/16	10	3/8	50
	SBD75155	155	6 1/8	40	1 9/16	20	13/16	50
	SBD75175	175	6 7/8	40	1 9/16	40	1 9/16	50
	SBD75195	195	7 11/16	40	1 9/16	40	1 9/16	50
	SBD75215	215	8 7/16	40	1 9/16	40	1 9/16	50
	SBD75235	235	9 1/4	40	1 9/16	40	1 9/16	50

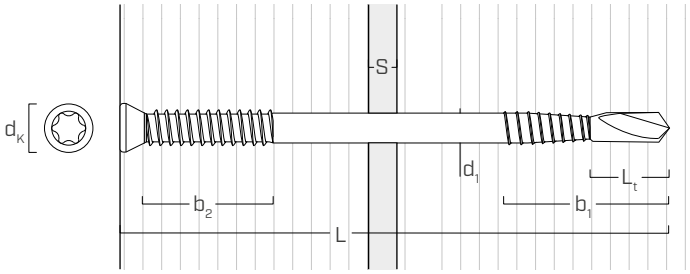
SBD L ≤ 2 15/16"



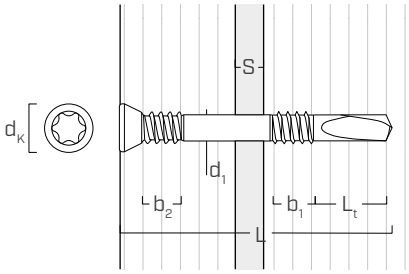
d_1 [mm] [in]	CODE	L [mm]	L [in]	b_1 [mm]	b_1 [in]	b_2 [mm]	b_2 [in]	pcs
7,5 **0.30** TX 40	**SBD7555**	55	2 3/16	-	-	10	3/8	50
	SBD7575	75	2 15/16	30	1 3/16	10	3/8	50

GEOMETRY AND MECHANICAL CHARACTERISTICS

SBD L ≥ 3 3/4"



SBD L ≤ 2 15/16"

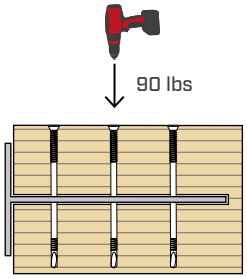


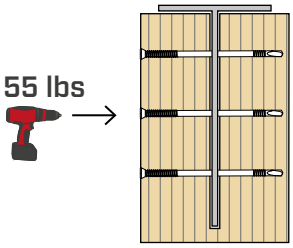
			SBD L ≥ 3 3/4"	SBD L ≤ 2 15/16"
Nominal diameter	d_1	**[in](1)**	**0.30**	**0.30**
Outer thread diameter	d_1	[mm]	7,5	7,5
		[in]	**0.295**	**0.295**
Head diameter	d_K	[in]	0.433	0.433
Effective Length	L_{eff}	[in]	L - 0.6	L - 0.3
Tip Length	L_t	[in]	0.787	0.945
Bending yield strength	$f_{y,b}$	[psi]	150000	150000

INSTALLATION | ALUMINIUM PLATE

plate	single plate	
	[mm]	[in]
ALUMINI	6	1/4
ALUMIDI	6	1/4
ALUMAXI	10	3/8

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1/8≤".





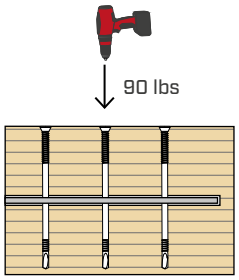
pressure to be applied	90 lbs
recommended screwdriver	Mafell A 18M BL
recommended speed	1st gear (600-1000 rpm)

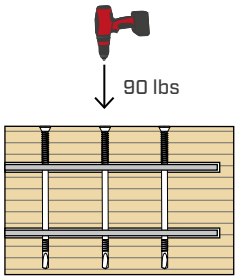
pressure to be applied	55 lbs
recommended screwdriver	Mafell A 18M BL
recommended speed	1st gear (600-1000 rpm)

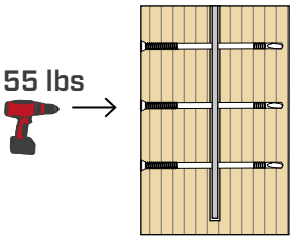
INSTALLATION | STEEL PLATE

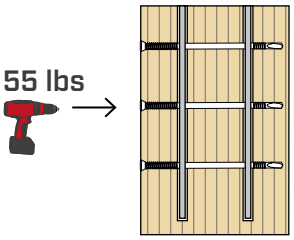
plate	single plate	double plate
	[in]	[in]
S235 steel	3/8	5/16
S275 steel	3/8	1/4
S355 steel	3/8	3/16

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1/8".









pressure to be applied	90 lbs
recommended screwdriver	Mafell A 18M BL
recommended speed	2nd gear (1000-1500 rpm)

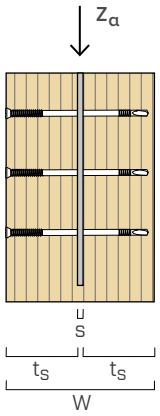
pressure to be applied	55 lbs
recommended screwdriver	Mafell A 18M BL
recommended speed	2nd gear (1500-2000 rpm)

PLATE HARDNESS

The steel plate hardness can greatly vary the pull-through times of the dowels.
Hardness is in fact defined as the material's strength to drilling or shear.
In general, the harder the plate, the longer the drilling time.
The hardness of the plate does not always depend on the strength of the steel, it can vary from point to point and is strongly influenced by heat treatments: standardised plates have a medium to low hardness, while the hardening process gives the steel high hardnesses.

TIMBER-TO-METAL-TO-TIMBER STRUCTURAL VALUES

1 INTERNAL KNIFE PLATE - DOWEL HEAD INSTALLATION DEPTH 0 in

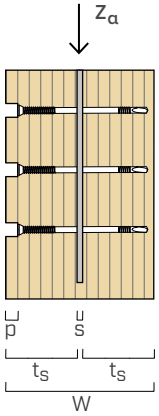


SBD Ø0.3 inch (7,5 mm)		[mm] [in]	55 2 3/16	75 2 15/16	95 3 3/4	115 4 1/2	135 5 5/16	155 6 1/8	175 6 7/8	195 7 11/16	215 8 7/16	235 9 1/4
beam width	**W**	[in]	2 1/2	3 1/8	4	5 1/8	5 1/2	6 3/4	7 1/2	8	8 3/4	9 3/4
head insertion depth	**p**	[in]	0	0	0	0	0	0	0	0	0	0

steel plate		**s**	**[in]**	**3/16**									
side wood		t_s	[in]	1.03	1.34	1.78	2.34	2.53	3.16	3.53	3.78	4.16	4.66
Z_α [lbf]	load-to-grain angle 0°		G=0.35	409	628	677	794	885	947	986	1046	1055	1055
			G=0.42	491	719	784	930	1011	1051	1102	1151	1151	1151
			G=0.49	572	810	890	1044	1128	1151	1213	1238	1238	1238
			G=0.55	642	886	980	1131	1207	1233	1305	1307	1307	1307
	load-to-grain angle 30°		G=0.35	328	511	560	651	740	806	837	883	911	911
			G=0.42	405	611	661	779	860	909	950	1007	1007	1007
			G=0.49	483	697	763	906	980	1007	1059	1096	1096	1096
			G=0.55	551	772	851	992	1067	1089	1150	1166	1166	1166
	load-to-grain angle 45°		G=0.35	280	435	491	566	655	709	750	787	819	827
			G=0.42	353	546	587	688	770	827	860	912	925	925
			G=0.49	428	631	687	814	887	925	969	1015	1015	1015
			G=0.55	495	705	774	911	988	1007	1061	1087	1087	1087
	load-to-grain angle 60°		G=0.35	242	376	436	499	588	632	676	710	737	756
			G=0.42	310	483	527	614	696	757	786	829	853	853
			G=0.49	383	575	623	734	809	853	892	944	944	944
			G=0.55	448	647	707	841	909	935	982	1017	1017	1017
	load-to-grain angle 90°		G=0.35	204	318	379	430	515	550	586	624	646	662
			G=0.42	266	415	461	534	613	665	698	734	765	765
			G=0.49	333	509	549	645	717	765	797	846	852	852
			G=0.55	394	577	628	746	811	842	883	922	922	922

steel plate		**s**	**[in]**	**5/16**									
side wood		t_s	[in]	0.97	1.28	1.72	2.28	2.47	3.09	3.47	3.72	4.09	4.59
Z_α [lbf]	load-to-grain angle 0°		G=0.35	373	601	654	770	874	941	980	1038	1055	1055
			G=0.42	447	694	756	900	997	1044	1094	1151	1151	1151
			G=0.49	522	779	856	1029	1118	1142	1203	1238	1238	1238
			G=0.55	586	851	942	1116	1197	1222	1294	1307	1307	1307
	load-to-grain angle 30°		G=0.35	299	482	542	632	732	797	832	877	911	911
			G=0.42	369	590	638	754	848	904	943	1003	1007	1007
			G=0.49	440	672	735	878	965	1000	1051	1096	1096	1096
			G=0.55	502	742	818	979	1059	1080	1140	1166	1166	1166
	load-to-grain angle 45°		G=0.35	255	411	476	550	649	701	746	783	814	827
			G=0.42	321	518	568	667	760	822	855	905	925	925
			G=0.49	390	609	662	787	874	919	962	1015	1015	1015
			G=0.55	452	678	745	894	974	999	1052	1087	1087	1087
	load-to-grain angle 60°		G=0.35	220	355	424	485	582	626	669	706	732	752
			G=0.42	283	456	510	595	688	750	781	824	853	853
			G=0.49	349	555	601	711	798	848	886	942	944	944
			G=0.55	408	623	682	815	895	928	975	1017	1017	1017
	load-to-grain angle 90°		G=0.35	186	300	368	419	510	545	580	619	642	659
			G=0.42	243	391	447	518	606	658	694	730	760	765
			G=0.49	303	489	530	625	708	761	792	840	852	852
			G=0.55	359	556	606	722	799	837	877	922	922	922

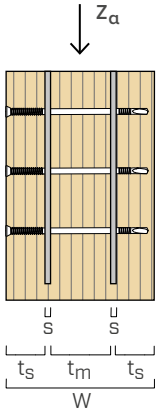
1 INTERNAL KNIFE PLATE - DOWEL HEAD INSTALLATION DEPTH 1/2 in



SBD Ø0.3 inch (7,5 mm)			[mm] [in]	55 2 3/16	75 2 15/16	95 3 3/4	115 4 1/2	135 5 5/16	155 6 1/8	175 6 7/8	195 7 11/16	215 8 7/16	235 9 1/4
beam width		**W**	[in]	3 1/8	4	5 1/8	5 1/2	6 3/4	7 1/2	8	8 3/4	9 3/4	10 3/4
head insertion depth		**p**	[in]	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
steel plate		**s**	**[in]**	**3/16**									
side wood		t_s	[in]	1.34	1.78	2.34	2.53	3.16	3.53	3.78	4.16	4.66	5.16
Z_α [lbf]	load-to-grain angle 0°	G=0.35		409	637	664	815	890	958	1013	1055	1055	1055
		G=0.42		491	737	769	920	1016	1066	1136	1151	1151	1151
		G=0.49		572	829	873	1023	1113	1169	1238	1238	1238	1238
		G=0.55		642	908	962	1110	1188	1254	1307	1307	1307	1307
	load-to-grain angle 30°	G=0.35		328	511	549	689	745	803	858	894	911	911
		G=0.42		405	626	648	788	864	921	977	1007	1007	1007
		G=0.49		483	715	748	887	977	1022	1093	1096	1096	1096
		G=0.55		551	791	835	972	1052	1107	1166	1166	1166	1166
	load-to-grain angle 45°	G=0.35		280	435	481	609	659	706	759	797	819	827
		G=0.42		353	549	576	711	774	836	883	924	925	925
		G=0.49		428	646	673	808	892	937	998	1015	1015	1015
		G=0.55		495	722	759	892	974	1022	1087	1087	1087	1087
	load-to-grain angle 60°	G=0.35		242	376	428	538	591	629	673	718	737	756
		G=0.42		310	483	517	647	700	756	805	840	853	853
		G=0.49		383	589	611	740	813	864	918	944	944	944
		G=0.55		448	663	694	823	906	949	1014	1017	1017	1017
	load-to-grain angle 90°	G=0.35		204	318	371	464	513	548	583	625	646	662
		G=0.42		266	415	452	573	617	662	714	743	765	765
		G=0.49		333	518	539	660	721	774	819	852	852	852
		G=0.55		394	591	616	737	815	854	911	922	922	922
steel plate		**s**	**[in]**	**5/16**									
side wood		t_s	[in]	1.28	1.72	2.28	2.47	3.09	3.47	3.72	4.09	4.59	5.09
Z_α [lbf]	load-to-grain angle 0°	G=0.35		373	601	641	806	879	952	1006	1053	1055	1055
		G=0.42		447	712	740	908	1002	1058	1127	1151	1151	1151
		G=0.49		522	799	839	1007	1105	1160	1238	1238	1238	1238
		G=0.55		586	873	924	1092	1179	1243	1307	1307	1307	1307
	load-to-grain angle 30°	G=0.35		299	482	531	682	736	793	852	889	911	911
		G=0.42		369	595	625	779	853	915	970	1007	1007	1007
		G=0.49		440	689	720	875	970	1015	1084	1096	1096	1096
		G=0.55		502	762	802	957	1044	1098	1166	1166	1166	1166
	load-to-grain angle 45°	G=0.35		255	411	466	594	653	698	750	792	814	827
		G=0.42		321	518	556	703	765	829	878	918	925	925
		G=0.49		390	625	649	797	879	931	991	1015	1015	1015
		G=0.55		452	696	730	879	968	1014	1087	1087	1087	1087
	load-to-grain angle 60°	G=0.35		220	355	415	524	583	622	665	714	732	752
		G=0.42		283	456	500	641	692	746	800	835	853	853
		G=0.49		349	562	589	731	802	859	911	944	944	944
		G=0.55		408	640	668	812	900	942	1006	1017	1017	1017
	load-to-grain angle 90°	G=0.35		186	300	361	453	501	542	577	618	642	659
		G=0.42		243	391	438	560	610	654	705	739	760	765
		G=0.49		303	489	520	652	712	769	814	852	852	852
		G=0.55		359	571	594	728	803	848	904	922	922	922

TIMBER-TO-METAL-TO-TIMBER STRUCTURAL VALUES

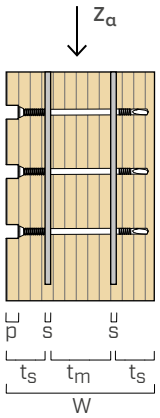
2 INTERNAL KNIFE PLATES - DOWEL HEAD INSTALLATION DEPTH 0 in



SBD Ø0.3 inch (7,5 mm)			[mm] [in]	135 5 5/16	155 6 1/8	175 6 7/8	195 7 11/16	215 8 7/16	235 9 1/4
beam width		**W**	[in]	5 1/2	6 3/4	7 1/2	8	8 3/4	9 3/4
head insertion depth		**p**	[in]	0	0	0	0	0	0
steel plate		**s**	**[in]**	**3/16**					
side wood		t_s	[in]	1.78	2.28	2.28	2.45	2.70	3.03
main wood		t_m	[in]	1.06	1.31	2.06	2.23	2.48	2.81
Z_α [lbf]	load-to-grain angle 0°	G=0.35		1297	1437	1485	1658	1722	1762
		G=0.42		1528	1686	1712	1857	1923	1936
		G=0.49		1758	1904	1934	2040	2082	2099
		G=0.55		1955	2079	2084	2168	2211	2231
	load-to-grain angle 30°	G=0.35		1058	1167	1232	1406	1457	1500
		G=0.42		1275	1415	1447	1598	1659	1686
		G=0.49		1495	1637	1662	1785	1835	1849
		G=0.55		1686	1817	1841	1929	1964	1981
	load-to-grain angle 45°	G=0.35		915	1006	1082	1260	1299	1336
		G=0.42		1122	1242	1289	1446	1503	1542
		G=0.49		1336	1478	1500	1632	1692	1705
		G=0.55		1525	1657	1683	1785	1825	1840
	load-to-grain angle 60°	G=0.35		803	879	962	1126	1172	1202
		G=0.42		998	1102	1159	1320	1368	1409
		G=0.49		1203	1336	1363	1500	1557	1581
		G=0.55		1387	1519	1542	1656	1703	1715
	load-to-grain angle 90°	G=0.35		689	752	834	974	1031	1055
		G=0.42		865	953	1016	1172	1211	1247
		G=0.49		1054	1168	1204	1341	1392	1422
		G=0.55		1226	1352	1373	1488	1541	1551
steel plate		**s**	**[in]**	**5/16**					
side wood		t_s	[in]	1.72	2.22	2.22	2.39	2.64	2.97
main wood		t_m	[in]	0.94	1.19	1.94	2.10	2.35	2.69
Z_α [lbf]	load-to-grain angle 0°	G=0.35		1218	1358	1483	1701	1781	1836
		G=0.42		1433	1605	1731	1914	2002	2035
		G=0.49		1646	1852	1954	2106	2191	2224
		G=0.55		1829	2063	2137	2259	2341	2379
	load-to-grain angle 30°	G=0.35		995	1104	1219	1430	1499	1551
		G=0.42		1197	1337	1452	1648	1719	1763
		G=0.49		1401	1573	1683	1838	1923	1949
		G=0.55		1579	1778	1863	1996	2071	2104
	load-to-grain angle 45°	G=0.35		862	953	1062	1263	1326	1382
		G=0.42		1054	1174	1285	1481	1553	1602
		G=0.49		1253	1404	1515	1683	1759	1791
		G=0.55		1428	1606	1701	1841	1918	1946
	load-to-grain angle 60°	G=0.35		757	834	938	1111	1188	1237
		G=0.42		938	1042	1149	1344	1409	1456
		G=0.49		1129	1262	1370	1549	1615	1654
		G=0.55		1300	1459	1562	1705	1784	1809
	load-to-grain angle 90°	G=0.35		650	714	811	955	1039	1079
		G=0.42		814	902	1001	1188	1241	1289
		G=0.49		990	1104	1204	1377	1441	1484
		G=0.55		1149	1288	1388	1534	1604	1631

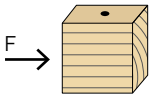
TIMBER-TO-METAL-TO-TIMBER STRUCTURAL VALUES

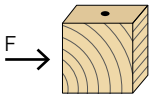
2 INTERNAL KNIFE PLATES - DOWEL HEAD INSTALLATION DEPTH 1/2 in



SBD Ø0.3 inch (7,5 mm)			[mm] [in]	135 5 5/16	155 6 1/8	175 6 7/8	195 7 11/16	215 8 7/16	235 9 1/4
beam width		**W**	[in]	6 3/4	7 1/2	8	8 3/4	9 3/4	10 3/4
head insertion depth		**p**	[in]	1/2	1/2	1/2	1/2	1/2	1/2
steel plate		**s**	**[in]**	**3/16**					
side wood		t_s	[in]	2.41	2.53	2.45	2.70	3.03	3.36
main wood		t_m	[in]	1.06	1.56	2.23	2.48	2.81	3.15
Z_α [lbf]	load-to-grain angle 0°	G=0.35		1235	1439	1550	1632	1682	1738
		G=0.42		1455	1654	1752	1824	1884	1918
		G=0.49		1674	1866	1917	2000	2061	2076
		G=0.55		1861	2035	2054	2143	2186	2204
	load-to-grain angle 30°	G=0.35		1007	1196	1285	1387	1424	1466
		G=0.42		1214	1401	1511	1571	1624	1672
		G=0.49		1424	1605	1679	1752	1808	1830
		G=0.55		1606	1780	1814	1893	1943	1958
	load-to-grain angle 45°	G=0.35		871	1041	1123	1245	1274	1307
		G=0.42		1068	1250	1346	1424	1467	1515
		G=0.49		1272	1450	1542	1603	1657	1689
		G=0.55		1452	1624	1677	1750	1807	1820
	load-to-grain angle 60°	G=0.35		764	911	993	1113	1152	1179
		G=0.42		950	1126	1210	1301	1337	1377
		G=0.49		1146	1319	1423	1475	1525	1567
		G=0.55		1321	1489	1558	1626	1677	1698
	load-to-grain angle 90°	G=0.35		656	779	858	958	1012	1037
		G=0.42		824	986	1057	1157	1186	1219
		G=0.49		1004	1167	1257	1319	1361	1405
		G=0.55		1167	1327	1404	1462	1510	1537
steel plate		**s**	**[in]**	**5/16**					
side wood		t_s	[in]	2.34	2.47	2.39	2.64	2.97	3.30
main wood		t_m	[in]	0.94	1.44	2.10	2.35	2.69	3.02
Z_α [lbf]	load-to-grain angle 0°	G=0.35		1157	1407	1518	1651	1734	1793
		G=0.42		1361	1644	1766	1866	1946	2000
		G=0.49		1564	1872	1953	2067	2147	2179
		G=0.55		1737	2060	2109	2222	2291	2327
	load-to-grain angle 30°	G=0.35		945	1145	1250	1392	1454	1516
		G=0.42		1137	1383	1485	1596	1675	1731
		G=0.49		1331	1602	1702	1801	1871	1913
		G=0.55		1500	1791	1853	1958	2030	2060
	load-to-grain angle 45°	G=0.35		819	988	1092	1232	1290	1346
		G=0.42		1002	1216	1316	1438	1509	1563
		G=0.49		1191	1439	1547	1638	1710	1760
		G=0.55		1357	1627	1706	1807	1876	1908
	load-to-grain angle 60°	G=0.35		719	865	967	1086	1159	1205
		G=0.42		891	1080	1178	1307	1366	1424
		G=0.49		1073	1303	1400	1500	1573	1626
		G=0.55		1235	1486	1579	1671	1736	1775
	load-to-grain angle 90°	G=0.35		618	741	836	936	998	1053
		G=0.42		774	935	1028	1157	1206	1260
		G=0.49		940	1144	1232	1336	1404	1450
		G=0.55		1092	1318	1417	1496	1559	1602

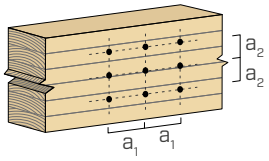
MINIMUM DISTANCES FOR DOWELS SUBJECT TO SHEAR



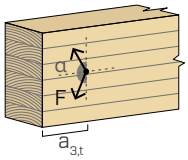


d_1	[in]		0.30	0.30
	[mm]		7,5	7,5
a_1	[in]	**4·d**	1 3/16	**4·d** 1 3/16
a_2	[in]	**5·d**	1 1/2	**5·d** 1 1/2
$a_{3,t}$	[in]	**7·d**	2 1/16	**4·d** 1 3/16
$a_{3,c}$	[in]	**4·d**	1 3/16	**4·d** 1 3/16
$a_{4,t}$	[in]	**4·d**	1 3/16	**4·d** 1 3/16
$a_{4,c}$	[in]	**4·d**	1 3/16	**4·d** 1 3/16

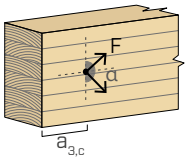
α = load-to-grain angle
d = d_1 = nominal dowel diamter



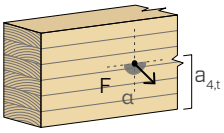
stressed end
-90° < α < 90°



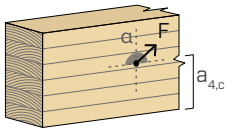
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°



NOTES

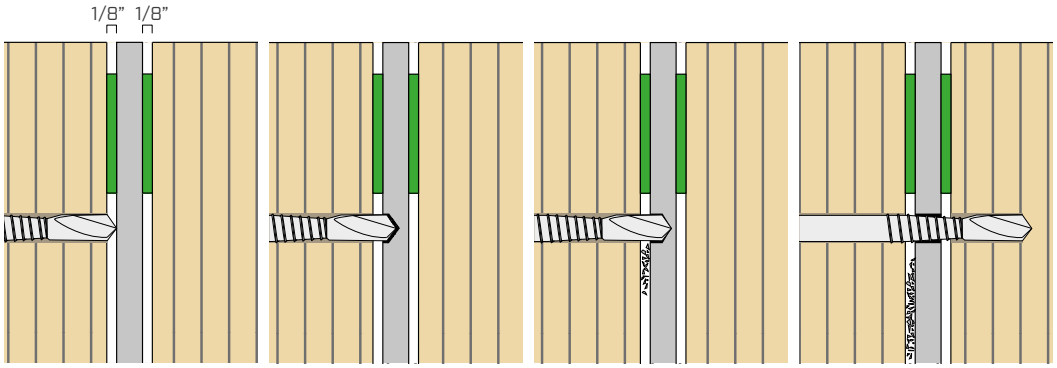
- The minimum spacing and distances comply with 2024 NDS, where d refers to the nominal diameter of the dowel.
- Wood member stresses must be checked in accordance with Section 11.1.2 and Appendix E of the NDS, and end distances, edge distances and fastener spacing may need to be increased accordingly.

GENERAL PRINCIPLES

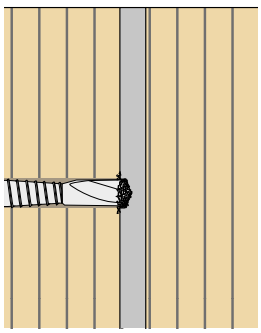
- Tabulated values comply with NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION in accordance with ESR-4645.
- To determine allowable loads for use with ASD, design loads for use with LRFD or both, tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners.
- 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 fasteners must be designed in accordance with the corresponding Sections of the NDS.
- SBD must be installed and used in dry in-service conditions in accordance with the NDS (wet service factor for connection CM is 1.0).
- SBD must be positioned in accordance with the minimum distances.
- Tabulated values are determined from the yield model equations in the corresponding Section of the NDS.
- The steel member must have a minimum tensile strength equal to 58 ksi (400 MPa) and comply with the minimum requirements of ASTM A36.
- Designed connections must respect all requirements on general principles and minimum distances.
- Tabulated values, that are referred to a single fastener, are valid for Allowable Stress Design (ASD) considering a standard loading (CD = 1.0).
- Tabulated values are determined considering this specific geometry of the connection. Different configuration with different steel plates or wood thichensses and different dowel head installation depth can be calculated according to NDS.
- A milling of 1/8" is considered for each side of the steel plate.

INSTALLATION

It is important to have **a milling in the wood equal to the thickness of the plate, increased by at least 1/4"**, placing SHIM spacers between the wood and the plate to centre it in the milling.
In this way, the steel residue from the drilling of the metal has an outlet to escape and does not obstruct the passage of the drill through the plate, thus avoiding overheating of the plate and timber and also preventing the generation of smoke during installation.



Cutter increased by 1/8" on each side.



Shavings obstructing the holes in the steel during drilling (spacers not installed).

To avoid breakage of the tip at the moment of pin-plate contact, it is recommended to **reach the plate slowly, pushing with a lower force until the moment of impact and then increasing it to the recommended value** (90 lbs | 40 kg for top-down applications and 55 lbs | 25 kg for horizontal installations). Try to keep the dowel as perpendicular as possible to the surface of the timber and the plate.

Intact tip after correct installation of the dowel.

Broken (cut) tip due to excessive force during impact with metal.

If the steel plate is too hard, the dowel tip may shrink significantly or even melt. In this case, it is advisable to check the material certificates for any heat treatment or hardness tests performed. Try decreasing the force applied or alternatively changing the type of plate.

Tip melted during installation on a too hard plate without spacers between timber and plate.

Reduction of the tip when drilling the plate due to the high hardness of the plate.