

45° WASHER FOR VGS

SAFETY

The VGU washer makes possible to install VGS screws at a 45° angle on steel plates. Washer assessed in ESR-4645.

PRACTICALITY

The ergonomic shape ensures a firm, precise grip during installation. Three versions of washer, compatible with VGS in diameter 0.36" (9 mm), 0.44" (11 mm) and 0.52" (13 mm), are available for plates of variable thickness.

The use of the VGU allows the use of inclined screws on plate without resorting to countersunk holes on the plate, which is generally a time-consuming and costly operation.

C4 EVO COATING

VGU EVO is coated with a surface treatment resistant to high atmospheric corrosivity.

Compatible with VGS EVO diameter 0.36", 0.44" and 0.52".



VGU



VGU EVO



VIDEO



MANUALS

DIAMETER [in] 0.36 **0.36** 0.52 0.60

MATERIAL



Zn
ELECTRO
PLATED

electrogalvanized carbon steel



C4
EVO
COATING

carbon steel with C4 EVO coating



METAL-to-TIMBER recommended use:



NO
IMPACT



TORQUE
LIMITER



M_{ins,max}

VIDEO

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



FIELDS OF USE

- timber based panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT and LVL
- high density woods
- steel construction
- metal plates and profiles

CODES AND DIMENSIONS

VGU WASHER

CODE	screw [in]	d _V [in]	pcs
VGU945	VGS Ø0.36	13/64	25
VGU1145	VGS Ø0.44	15/64	25
VGU1345	VGS Ø0.52	5/16	25

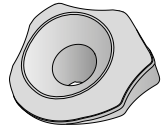
d_V = pre-drilling hole diameter (G < 0.55).



VGU EVO WASHER

CODE	screw [in]	d _V [in]	pcs
VGUEVO945	VGS Ø0.36	13/64	25
VGUEVO1145	VGS Ø0.44	15/64	25
VGUEVO1345	VGS Ø0.52	5/16	25

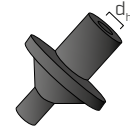
d_V = pre-drilling hole diameter (G < 0.55).



JIG VGU TEMPLATE

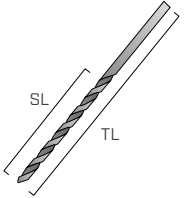
CODE	washer	d _h		d _v	pcs
	[mm]	[mm]	[in]	[in]	
JIGVGU945	VGU945	5,5	7/32	13/64	25
JIGVGU1145	VGU1145	6,5	1/4	15/64	25
JIGVGU1345	VGU1345	8,5	5/16	5/16	25

For more information see page 437.

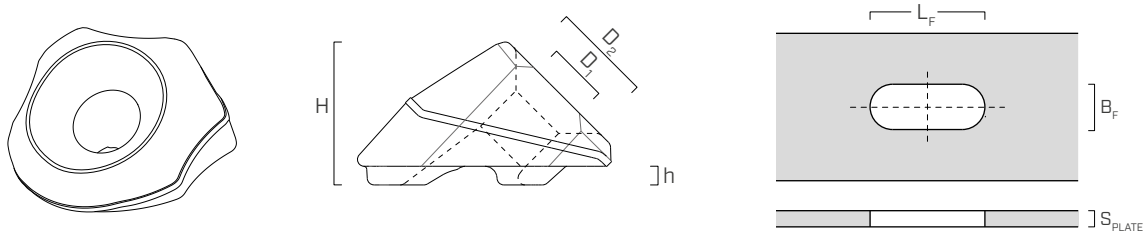


HSS WOOD DRILL BIT

CODE	screw [mm]	d _V [in]	TL [in]	SL [in]	pcs
F1599105	VGS Ø0.36	13/64	6	4	25
F1599106	VGS Ø0.44	15/64	6	4	25
F1599108	VGS Ø0.52	5/16	6	4	25



GEOMETRY

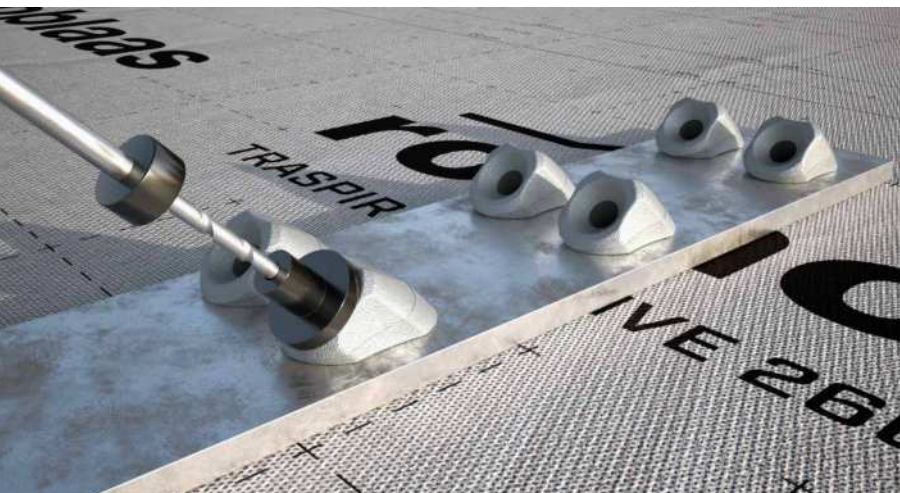


Washer			VGU945 VGUEVO945	VGU1145 VGUEVO1145	VGU1345 VGUEVO1345
VGS screw diameter	d ₁	[mm] [in]	9 0.36	11 0.44	13 0.52
VGS screw pre-drilling hole diameter ⁽¹⁾	d _V	[in]	13/64	15/64	5/16
Internal diameter	D ₁	[in]	0.382	0.465	0.551
External diameter	D ₂	[in]	0.748	0.906	1.079
Base height	h	[in]	0.118	0.142	0.169
Global height	H	[in]	0.906	1.102	1.299
Slotted-hole length	L _F	[in]	1.299 - 1.339	1.614 - 1.654	1.929 - 1.969
Slotted-hole width	B _F	[in]	0.551 - 0.591	0.669 - 0.709	0.787 - 0.827
Steel plate thickness ⁽²⁾	S _{PLATE}	[in]	1/8 - 1/2	3/16 - 9/16	3/16 - 9/16

⁽¹⁾Pre-drilling valid for wood with G < 0.55.

⁽²⁾For thicker plates than those indicated in the table it is necessary to carry out a countersink in the lower part of the steel plate.

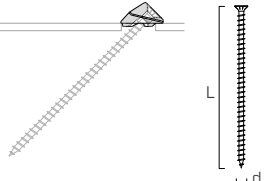
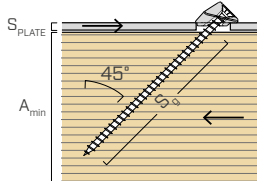
Recommended guide hole with diameter equal to d_{V,S} and minimum length 1 inch. For VGS screws of length L > 300 mm (11 3/4 inches), a guide hole at least 2 inches long is recommended.



HELPS WITH INSTALLATION

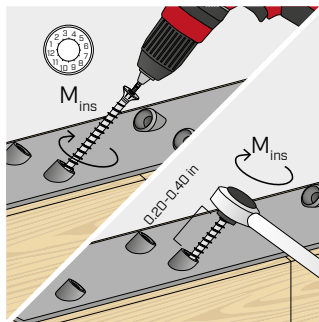
The JIG VGU template makes it easy to prepare a 45° angle pre-drill, thus facilitating subsequent tightening of the VGS screws inside the washer. A pre-drill length of at least 1 inch is recommended.

SLIDING RESISTANCE (R_V) | WOOD

geometry					sliding											
																
VGU VGU EVO	VGS/VGS EVO			Sg	Amin	RV G				Sg	Amin	RV G				
	d1 [mm] [in]	L [mm] [in]	0.35 [lbf]			0.42 [lbf]	0.49 [lbf]	0.55 [lbf]	0.35 [lbf]			0.42 [lbf]	0.49 [lbf]	0.55 [lbf]		
SPLATE					1/8 [in]				1/2 [in]							
VGU945 VGUEVO945	9 0.36	100	4	2 9/16	3 1/2	317	363	420	462	2 3/16	3 1/2	270	310	359	394	
		120	4 3/4	3 3/8	2 3/8	417	478	554	608	2 15/16	4 1/8	363	416	482	529	
		140	5 1/2	4 1/8	2 11/16	510	584	677	743	3 3/4	4 5/8	463	531	615	676	
		160	6 1/4	4 15/16	3	610	699	810	890	4 1/2	5 3/16	556	637	738	811	
		180	7 1/8	5 11/16	3 1/4	703	805	933	1025	5 5/16	5 3/4	656	752	872	957	
		200	8	6 1/2	3 1/2	803	920	1067	1171	6 1/8	6 1/4	757	867	1005	1104	
		220	8 5/8	7 1/4	3 13/16	896	1026	1190	1306	6 7/8	6 7/8	849	973	1128	1239	
		240	9 1/2	8 1/16	4 1/8	996	1141	1323	1453	7 11/16	7 7/16	950	1088	1261	1385	
		260	10 1/4	8 7/8	4 3/8	1096	1256	1456	1599	8 7/16	8 1/16	1042	1194	1384	1520	
		280	11	9 5/8	4 5/8	1189	1363	1579	1734	9 1/4	8 5/8	1143	1309	1518	1667	
		300	11 3/4	10 7/16	4 15/16	1290	1478	1713	1881	10 1/16	9 1/4	1243	1424	1651	1813	
		320	12 5/8	11 1/4	5 3/16	1390	1593	1846	2027	10 7/8	9 5/8	1344	1539	1784	1959	
		340	13 3/8	12	5 1/2	1483	1699	1969	2162	11 5/8	10 1/4	1436	1646	1907	2094	
		360	14 1/4	12 3/4	5 3/4	1575	1805	2092	2297	12 3/8	10 7/8	1529	1752	2031	2230	
		380	15	13 9/16	6	1676	1920	2225	2444	13 3/16	11 7/16	1629	1867	2164	2376	
		400	15 3/4	14 3/8	6 1/4	1776	2035	2359	2590	14	12	1730	1982	2297	2522	
		440	17 1/4	15 15/16	6 7/8	1969	2256	2615	2871	15 9/16	13	1923	2203	2554	2804	
		480	19	17 1/2	7 7/16	2162	2477	2871	3153	17 1/8	14 1/4	2116	2424	2810	3085	
		520	20 1/2	19 1/8	8 1/16	2363	2707	3138	3446	18 11/16	15 3/8	2309	2645	3066	3367	
		560	22	20 11/16	8 5/8	2556	2929	3394	3727	20 1/4	16 5/16	2502	2867	3323	3648	
		600	23 5/8	22 1/4	9 1/4	2749	3150	3651	4009	21 7/8	17 1/2	2703	3097	3589	3941	
SPLATE					3/16 [in]				9/16 [in]							
VGU1145 VGUEVO1145	11 0.44	80	3 1/8	1 9/16	3	208	241	273	300	1	3	133	154	175	192	
		100	4	2 3/8	3 1/2	316	367	416	455	1 3/4	3 1/2	233	270	306	336	
		125	4 15/16	3 3/8	4 3/16	450	521	591	647	2 3/4	4 3/16	366	425	481	527	
		150	6	4 3/8	4 15/16	583	676	766	839	3 3/4	4 15/16	499	579	656	719	
		175	6 7/8	5 5/16	5 5/8	708	820	930	1019	4 3/4	5 5/8	633	734	831	911	
		200	8	6 1/4	6 1/4	832	965	1094	1198	5 11/16	6 1/4	758	878	995	1091	
		225	8 7/8	7 1/4	7	966	1120	1269	1390	6 3/4	7	899	1042	1181	1294	
		250	10	8 1/4	7 11/16	1099	1274	1444	1582	7 11/16	7 11/16	1024	1187	1345	1474	
		275	10 7/8	9 1/4	8 7/16	1232	1428	1619	1774	8 5/8	8 7/16	1149	1332	1510	1654	
		300	11 3/4	10 1/4	9 1/4	1365	1583	1794	1965	9 5/8	9 1/4	1282	1486	1685	1846	
		325	12 3/4	11 1/4	10	1498	1737	1969	2157	10 5/8	10	1415	1641	1860	2037	
		350	13 3/4	12 3/16	10 5/8	1623	1882	2133	2337	11 5/8	10 5/8	1548	1795	2035	2229	
		375	14 3/4	13 3/16	11 1/4	1757	2037	2308	2529	12 5/8	11 1/4	1682	1950	2210	2421	
		400	15 3/4	14 1/4	12	1898	2201	2494	2732	13 9/16	12	1806	2094	2374	2601	
		425	16 3/4	15 3/16	12 5/8	2023	2345	2658	2912	14 9/16	12 5/8	1940	2249	2549	2792	
		450	17 3/4	16 1/8	13 3/8	2148	2490	2822	3092	15 9/16	13 3/8	2073	2403	2724	2984	
		475	18 11/16	17 1/8	14	2281	2645	2997	3284	16 9/16	14	2206	2558	2899	3176	
		500	19 3/4	18 1/8	14 3/4	2414	2799	3172	3476	17 1/2	14 3/4	2331	2703	3063	3356	
		525	20 11/16	19 1/8	15 3/8	2547	2954	3347	3667	18 1/2	15 3/8	2464	2857	3238	3547	
		550	21 5/8	20 1/16	16 1/8	2672	3098	3511	3847	19 1/2	16 1/8	2597	3011	3413	3739	
		575	22 5/8	21 1/16	16 15/16	2805	3253	3686	4039	20 1/2	16 15/16	2731	3166	3588	3931	
600	23 5/8	22	17 1/2	2930	3398	3851	4219	21 7/16	17 1/2	2855	3311	3752	4111			
SPLATE					3/16 [in]				9/16 [in]							
VGU1345 VGUEVO1345	13 0.52	80	3 1/8	1 3/16	3	180	208	235	258	13/16	3	123	142	161	177	
		100	4	1 15/16	3 1/2	293	339	384	421	1 9/16	3 1/2	236	273	310	340	
		150	6	4	4 15/16	605	700	793	870	3 1/2	4 15/16	529	613	694	761	
		200	8	6	6 1/4	907	1050	1189	1305	5 1/2	6 1/4	832	963	1090	1196	
		250	10	8	7 11/16	1210	1400	1586	1740	7 1/2	7 11/16	1134	1313	1486	1631	
		300	11 3/4	10	9 1/4	1512	1750	1982	2175	9 1/2	9 1/4	1437	1663	1883	2066	
		350	13 3/4	11 3/4	10 5/8	1777	2057	2329	2556	11 7/16	10 5/8	1730	2002	2267	2488	
		400	15 3/4	13 3/4	12	2079	2407	2725	2991	13 3/8	12	2022	2341	2651	2909	
		450	17 3/4	15 3/4	13 3/8	2382	2757	3121	3425	15 3/8	13 3/8	2325	2691	3047	3344	
		500	19 3/4	17 3/4	14 3/4	2684	3107	3518	3860	17 1/4	14 3/4	2608	3019	3419	3752	
		550	21 5/8	19 3/4	16 1/8	2986	3457	3914	4295	19 5/16	16 1/8	2920	3380	3828	4200	
		600	23 5/8	21 5/8	17 1/2	3270	3785	4286	4703	21 1/4	17 1/2	3213	3719	4211	4622	

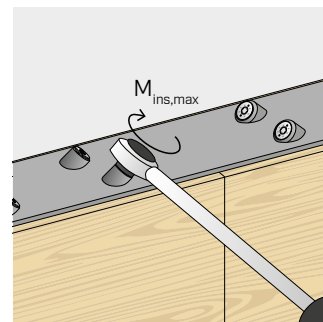


The use of pulse screw guns/impact wrenches is not permitted.

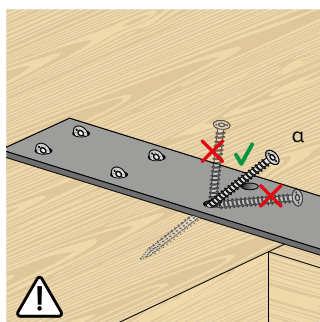


Ensure tightening torque is less than or equal to the Maximum recommended tightening torque ($M_{ins,max}$). We recommend the use of torque-controlled screwdrivers, e.g. with TORQUE LIMITER. Alternatively, tighten with a torque wrench.

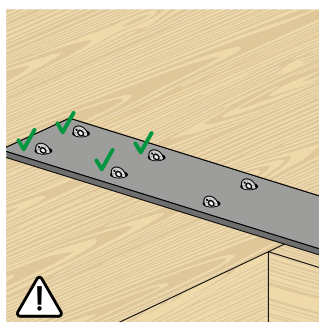
VGS	d_1 [in]	$M_{ins,max}$ [ft-lbs]
Ø0.36	0.36	15
Ø0.44 $L < 15 \frac{3}{4}$ mm	0.44	22
Ø0.44 $L \geq 15 \frac{3}{4}$ mm	0.44	30
Ø0.52	0.52	37



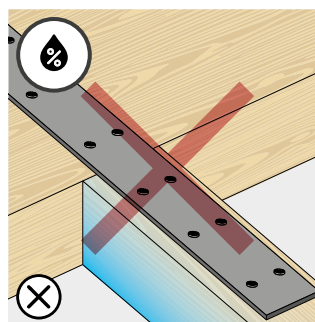
After installation, the fasteners can be inspected using a torque wrench.



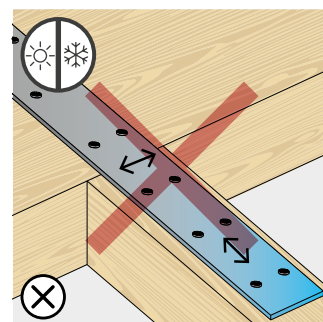
Avoid bending.



The installation of multiple screws must be performed to guarantee that loads are distributed evenly to all fasteners.

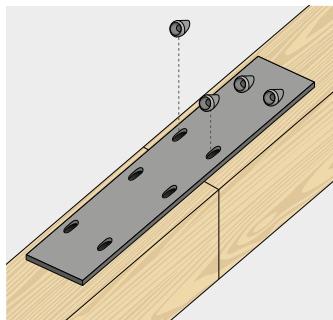


Shrinkage or swelling of timber elements due to changes in moisture content must be avoided.

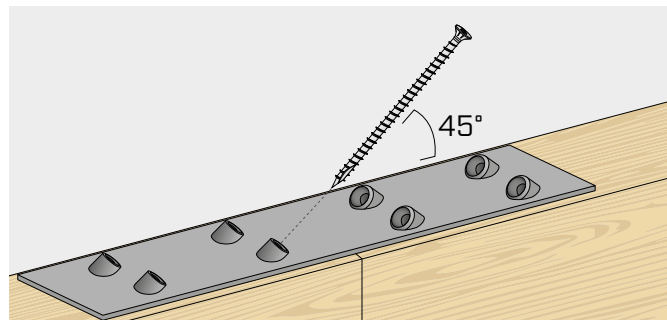
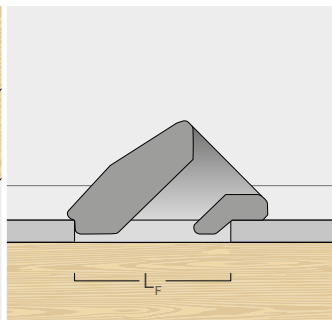


Avoid dimensional changes in the metal, e.g. due to large temperature fluctuations.

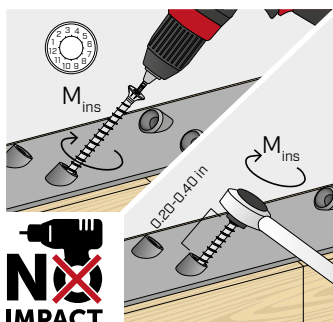
INSTALLATION WITHOUT PRE-DRILL



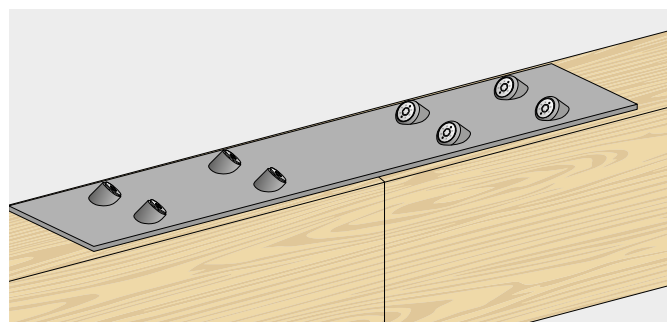
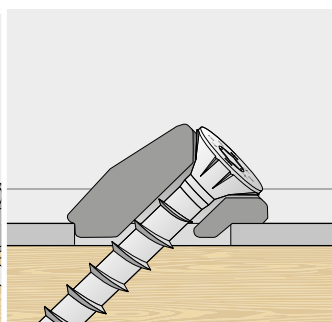
Place the steel plate on the wood and set the VGU washers in the slots provided.



Position the screw and respect the 45° angle of insertion.

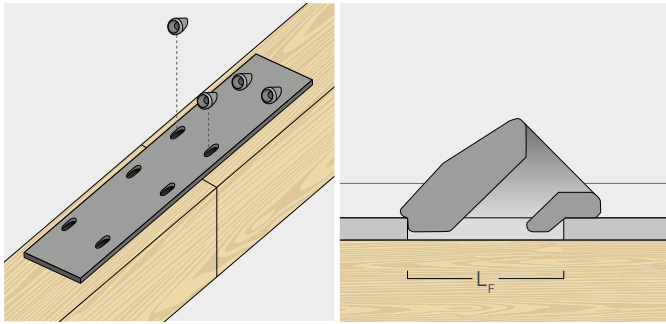


Install the screw, and stop when the screw head makes contact with the metal element. Ensure correct tightening and full contact between the entire surface of the screw head and the metal element.

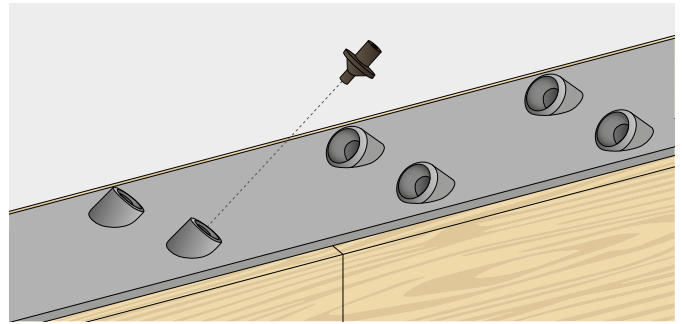


Perform the operation for all washers. The assembly must be performed so as to guarantee that the stress is evenly distributed among all the installed VGU washers.

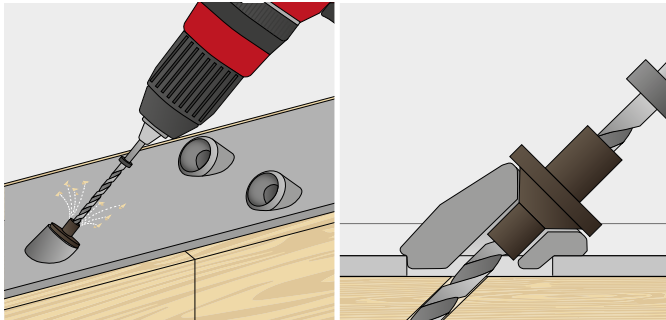
INSTALLATION WITH THE AID OF A PRE-DRILL JIG



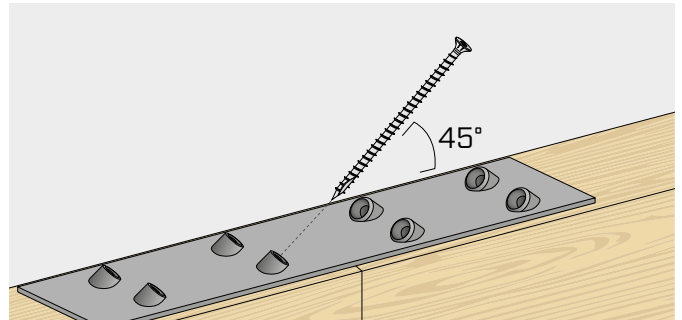
Place the steel plate on the wood and set the VGU washers in the slots provided.



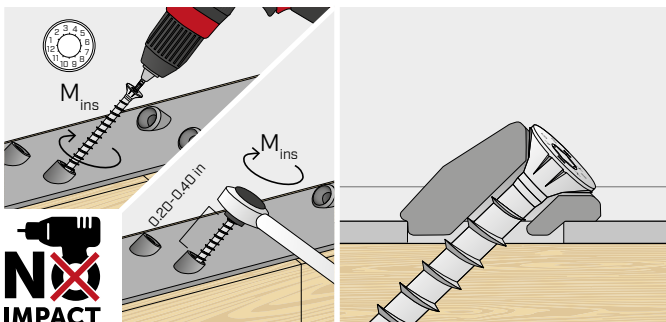
Use the VGU JIG template of the correct diameter by positioning it in the VGU washer



Using the pre-drill template, prepare a pre-drill/guide hole (at least 2 inches length) using an appropriate tip.

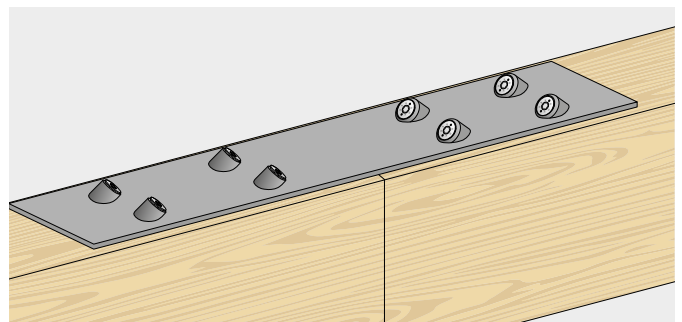


Position the screw and respect the 45° angle of insertion.



Install the screw, and stop when the screw head makes contact with the metal element.

Ensure correct tightening and full contact between the entire surface of the screw head and the metal element.



Perform the operation for all washers.

The assembly must be performed so as to guarantee that the stress is evenly distributed among all the installed VGU washers.

NOTE

- Check VGS INSTALLATION INSTRUCTIONS on Rothoblaas's website or inside the product box for the complete installation indications.

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.
- VGZ screws must be installed and used in dry in-service conditions in accordance with the NDS (wet service factor for connection CM is 1.0).
- VGZ screws must be positioned in accordance with the minimum distances.
- For simultaneous loads, in different directions, on a screw, the allowable load must be evaluated using the following equation: (Design Uplift ÷ Allowable Up-

lift) + (Design F_1 ÷ Allowable F_1) + (Design F_2 ÷ Allowable F_2) ≤ 1.0, where the three terms in the unity equation represent the possible generated force directions. The number of terms that must be considered for simultaneous loading is the sole discretion of the designer and depends on the method of calculating wind forces and the utilization of the screws within the structural system.

SLIDING RESISTANCE

- Unless otherwise noted, the screws are intended to be inserted half in the main member and half in the side member.
- The 45° inclined screw is intended to work in withdrawal and the resulting resistance of the connection is given by the projection of the withdrawal resistance (along screw axis) onto the shear plane.
- The design values must be inferior to f_{tens} of the screw projected onto the shear plane.