PILLAR

COLUMN-TO-FLOOR CONNECTION SYSTEM

VIDEO

DESIGN REGISTERED

ETA-19/0700

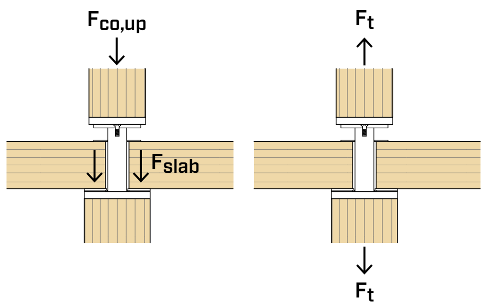
SERVICE CLASS SC1 SC2

MATERIAL

S355 Fe/Zn12c — S355 + Fe/Zn12c carbon steel

S690 Fe/Zn12c — S690 + Fe/Zn12c carbon steel

EXTERNAL LOADS



BUILDINGS ON COLUMNS

The system allows the construction of buildings with a post-and-slab system. Distance between columns up to 3,5 x 7,0 m. inside the SPIDER system is ideal for use on columns in the corners or on the perimeter of the structural grid.

COLUMN-TO-COLUMN

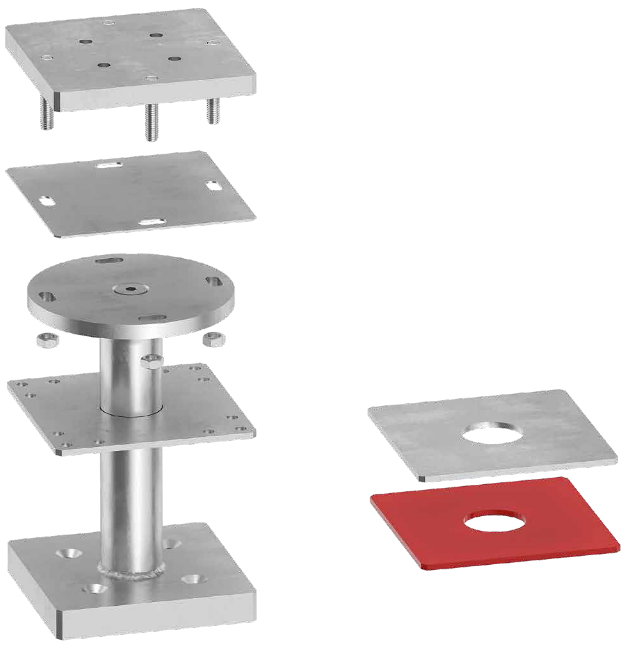
The steel core of the system prevents the CLT panels from being crushed and allows more than 5000 kN of vertical load to be transferred between the columns.

FIRE SAFETY

The connector is compact, allowing it to allow it to remain within the footprint of the columns and floor, providing fire protection.

VIDEO

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



FIELDS OF USE

Multi-storey buildings with column-to-floor system. Solid timber, glulam, high density timber, CLT, LVL, steel and reinforced concrete columns.

MULTI-STOREY

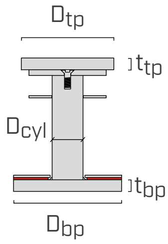
Connection system for large point-to-point compression loads on timber, concrete or steel columns. Reliable and tested on buildings with over 15 storeys.

POST BASE

Versatile and certified connection also on concrete, used at the base of the timber column. With a nut and lock nut system, the height of the support can be adjusted.

CODES AND DIMENSIONS

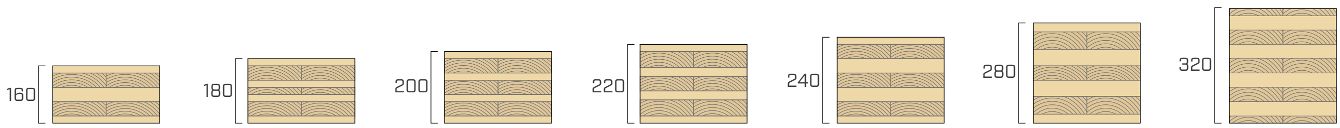
PILLAR CONNECTOR



The code consists of the respective CLT panel thickness in mm (XXX = t_{CLT}).
Example: the **PIL80M** XXX for CLT panels with XXX = t_{CLT} = 200 mm has the code **PIL80M200**.

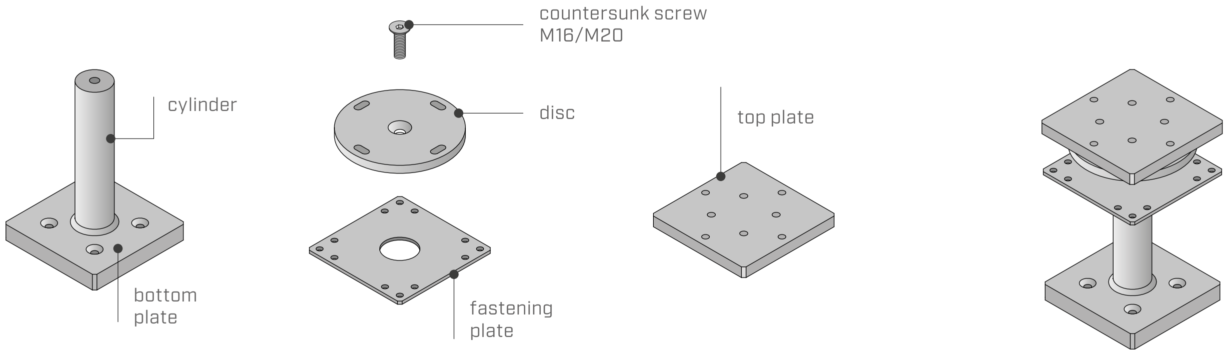
CODE	cylinder D_{cyl} [mm]	bottom plate D_{bp} x t_{bp} [mm]	top plate D_{tp} x t_{tp} [mm]	weight [kg]	pcs
PIL60SXXX	60	200 x 30	200 x 20	26,4	1
PIL80SXXX	80	240 x 30	200 x 30	38,2	1
PIL80MXXX	80	280 x 30	240 x 30	43,7	1
PIL80LXXX	80	280 x 40	280 x 40	64.3	1
PIL100SXXX	100	240 x 30	240 x 20	42,2	1
PIL100MXXX	100	280 x 30	280 x 30	55,5	1
PIL120SXXX	120	280 x 30	280 x 30	60,3	1
PIL120MXXX	120	280 x 40	280 x 40	72,5	1
PIL100LXXX	100	280 x 20	not provided	34,7	1
PIL120LXXX	120	280 x 20	not provided	41,8	1

XXX = t_{CLT} [mm]						
160	180	200	220	240	280	320



Also available for intermediate t_{CLT} thickness values not shown in the table.

Each code includes the following components:



XYLOFON WASHER (optional)

CODE	suitable for	pcs
XYLWXX**60200**	PIL60S	1
XYLWXX**80240**	PIL80S	1
XYLWXX**80280**	PIL80M - PIL80L	1
XYLWXX**100240**	PIL100S	1
XYLWXX**100280**	PIL100M - PIL100L	1
XYLWXX**120280**	PIL120S - PIL120M - PIL120L	1

The code consists of the respective XYLOFON shore (35, 50, 70, 80 or 90).
XYLOFON WASHER 35 shore for PIL80M: code **XYLW3580280**

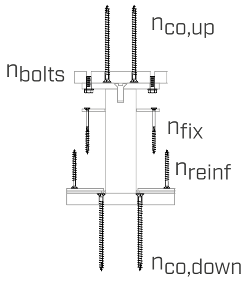
DISTRIBUTION PLATE (optional)

CODE	suitable for	pcs
SP60200	PIL60S	1
SP80240	PIL80S	1
SP80280	PIL80M - PIL80L	1
SP100240	PIL100S	1
SP100280	PIL100M - PIL100L	1
SP120280	PIL120S - PIL120M - PIL120L	1

The distribution plate is to be used only in the presence of XYLOFON WASHER + reinforcement screws.

CODES AND DIMENSIONS

NUMBER OF SCREWS FOR EACH CONNECTOR



$n_{co,up}$	4	VGS Ø11
$n_{co,down}$	4	VGS Ø11
n_{bolts}	4	SPBOLT1235 - SPROD1270
n_{fix}	12	HBS PLATE Ø8
n_{reinf}	refer to the GEOMETRY AND MATERIALS section on page pagina 20	VGS Ø9

Screws and bolts not included in the package.
The n_{reinf} reinforcement screws are optional.

ADDITIONAL PRODUCTS - FASTENING

SCREWS

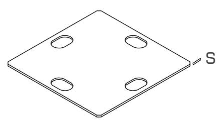
type	description	d [mm]	support
HBS PLATE	pan head screw	8	
VGS	fully threaded countersunk screw	9-11	

BOLTS - METRIC

CODE	description	d [mm]	L [mm]	SW [mm]
SPBOLT1235	hexagonal head bolt 8.8 DIN 933 EN 15048	M12	35	19
SPROD1270	threaded rod 8.8 DIN 976-1	M12	70	-
MUT93412	hexagonal nut class 8 DIN 934-M12	M12	-	19
ULS13242	DIN 125 washer	-	-	-

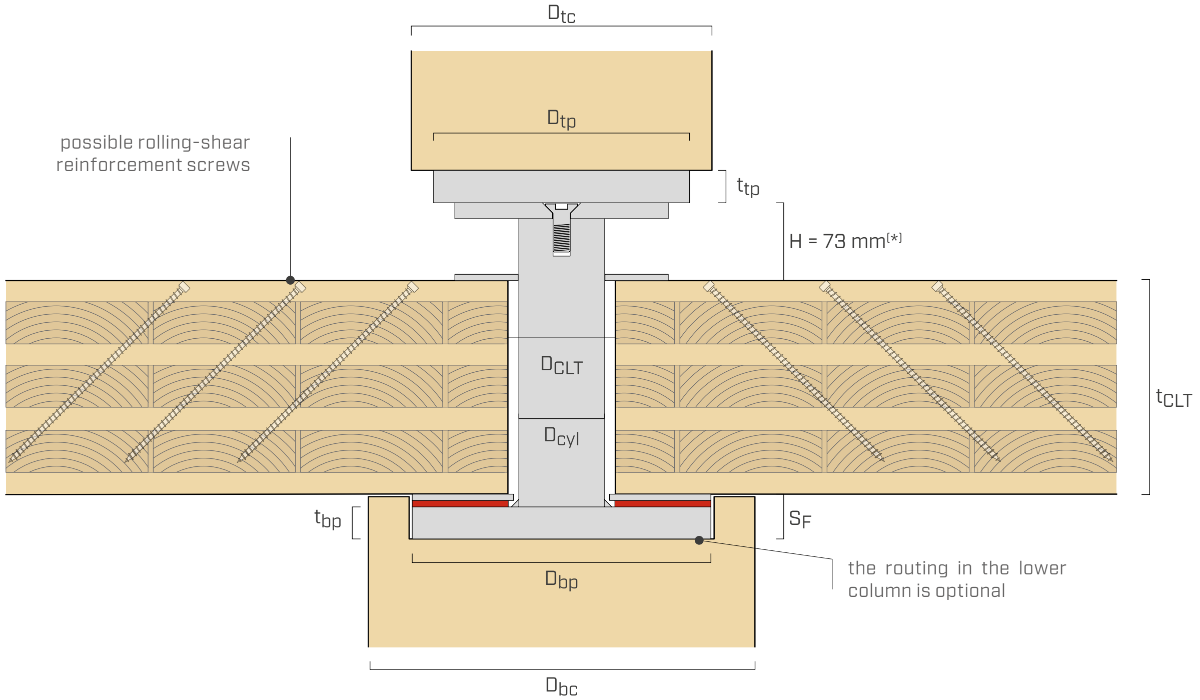
ASSEMBLY ACCESSORIES

CODE	description	s [mm]	pcs
PILSHIM10	levelling shim	1	20
PILSHIM20	levelling shim	2	10



The **data sheet** complete with **structural values** is available at www.rothoblaas.com

GEOMETRY AND MATERIALS



(*) In case of application without XYLOFON WASHER and distribution plate (H = 85 mm). In case of application of XYLOFON alone (H = 79 mm).

CONNECTOR

MODEL	bottom plate D_{bp} x t_{bp} [mm]	bottom plate shape	bottom plate material	cylinder D_{cyl} [mm]	cylinder material	disc material	top plate D_{tp} x t_{tp} [mm]	top plate shape	top plate material
PIL60S	200 x 30	☐	S355	60	S355	S355	200 x 20	☐	S355
PIL80S	240 x 30	☐	S355	80	S355	S355	200 x 30	☐	S355
PIL80M	280 x 30	☐	S690	80	S355	S355	240 x 30	☐	S690
PIL80L	280 x 40	☐	S690	80	S355	S355	280 x 40	☐	S690
PIL100S	240 x 30	☐	S690	100	S355	S355	240 x 20	☐	S690
PIL100M	280 x 30	☐	S690	100	S355	S355	280 x 30	☐	S690
PIL120S	280 x 30	☐	S690	120	S355	S355	280 x 30	☐	S690
PIL120M	280 x 40	☐	S690	120	S355	S355	280 x 40	☐	S690
PIL100L	280 x 20	☐	S690	100	1,7225	S690	-	-	-
PIL120L	280 x 20	☐	S690	120	1,7225	S690	-	-	-

PIL100L and PIL120L provide for fastening on steel columns without using the top plate.

COLUMNS AND CLT PANELS

MODEL	upper column $D_{tc,min}$ [mm]	lower column $D_{bc,min}$ [mm]	lower column S_F* [mm]	CLT panel D_{CLT} [mm]	reinforcement (optional) R_{screws} [mm]	reinforcement (optional) n_{reinf} central	reinforcement (optional) n_{reinf} edge	reinforcement (optional) n_{reinf} angle
PIL60S	200	200	30	80	85	14	6	2
PIL80S	200	240	30	100	105	14	6	2
PIL80M	240	280	30	100	120	16	7	3
PIL80L	280	280	40	100	120	16	7	3
PIL100S	240	240	30	120	105	14	6	2
PIL100M	280	280	30	120	120	16	7	3
PIL120S	280	280	30	140	120	16	7	3
PIL120M	280	280	40	140	120	16	7	3
PIL100L	200	280	-	120	120	16	7	3
PIL120L	200	280	-	140	120	16	7	3

* The thickness of the S_F routing in the lower column must be increased by 6 mm when using XYLOFON WASHER and by 12 mm when using XYLOFON WASHER + distribution plate.

GEOMETRY AND MATERIALS

CHARACTERISTICS OF CLT PANELS

Parameter	160 mm ≤ t_{CLT}
Lamellas thickness	≤ 40 mm
Minimum strength class according to EN 338	C24/T14

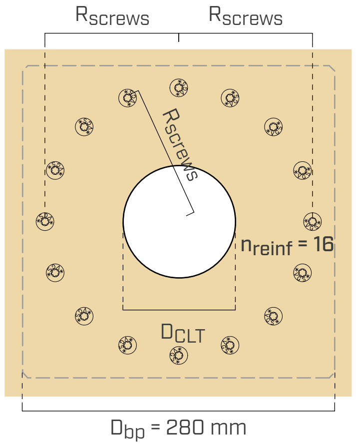
REINFORCEMENT SCREWS FOR CLT PANEL

t_{CLT} [mm]	reinforcement screws (optional) [pcs - ØxL]
160	VGS Ø9x100
180	VGS Ø9x100
200	VGS Ø9x100
220	VGS Ø9x120
240	VGS Ø9x120
280	VGS Ø9x140
320	VGS Ø9x140

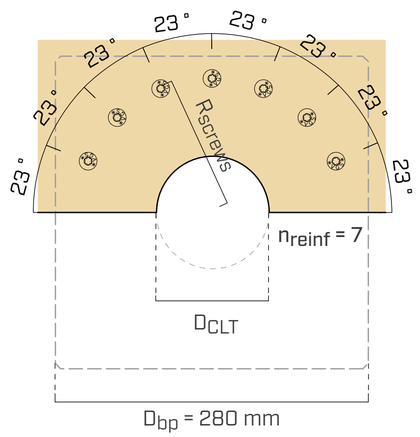
For intermediate panel thickness values use the length provided for the top panel.
Example: for CLT panels with thickness of 210 mm, VGS Ø9x120 reinforcement screws will be used.

REINFORCEMENT SCREWS (OPTIONAL)

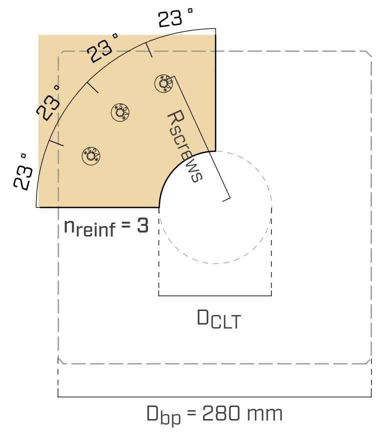
CENTRAL SUPPORT



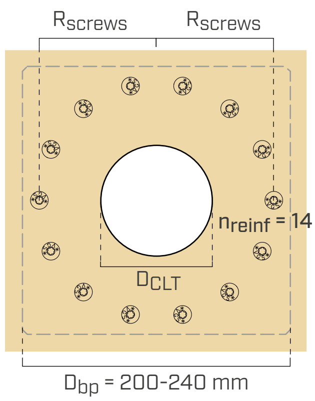
EDGE SUPPORT



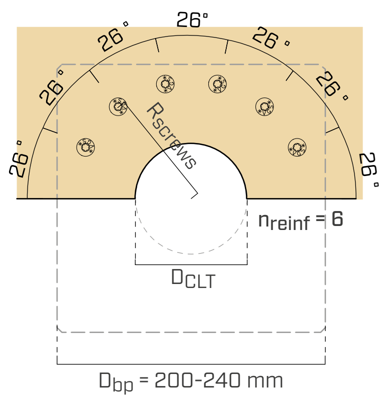
CORNER SUPPORT



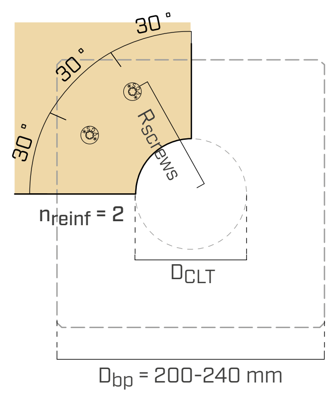
CENTRAL SUPPORT



EDGE SUPPORT



CORNER SUPPORT

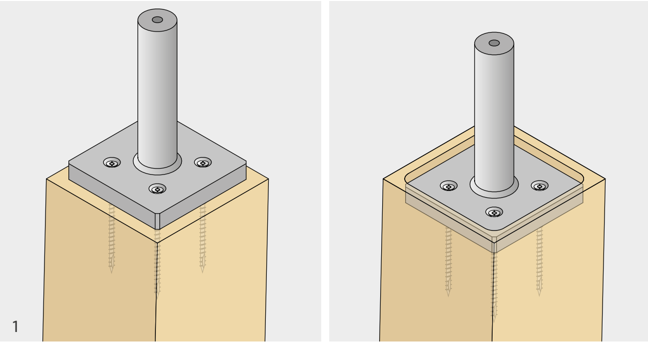


INTELLECTUAL PROPERTY

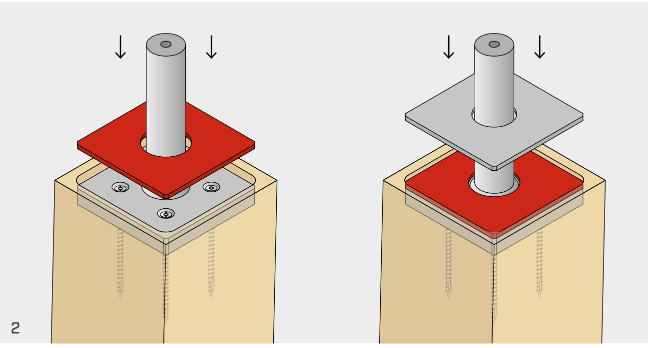
- Some PILLAR connector models are protected by the following Registered Community Designs:
  - RCD 008254353-0012;
  - RCD 008254353-0013.

MOUNTING

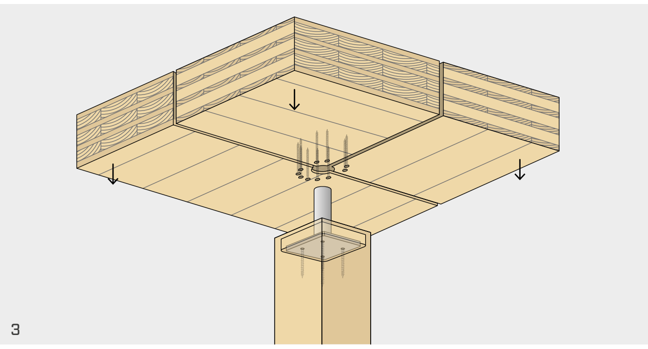
VIDEO



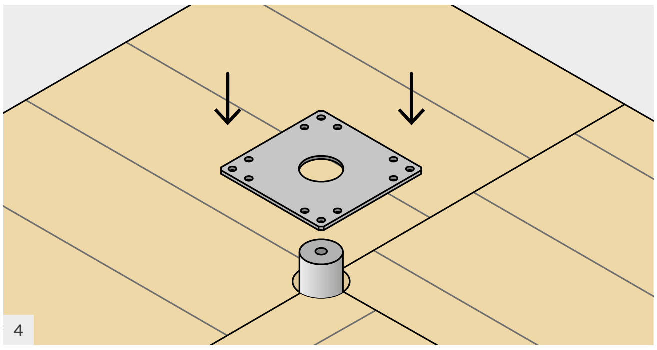
Fasten the bottom plate to the upper face of the column using the VGS Ø11 screws in accordance with the relevant installation instructions. It is possible to conceal the bottom plate in a routing prepared in the column. For installation on steel columns it is possible to use M12 countersunk head bolts. Use suitable countersunk head connectors in case of installation on reinforced concrete columns. If the cylinder and base plate are positioned horizontally, it is recommended to fix a temporary support to enable the element to be fastened on axis to the column.



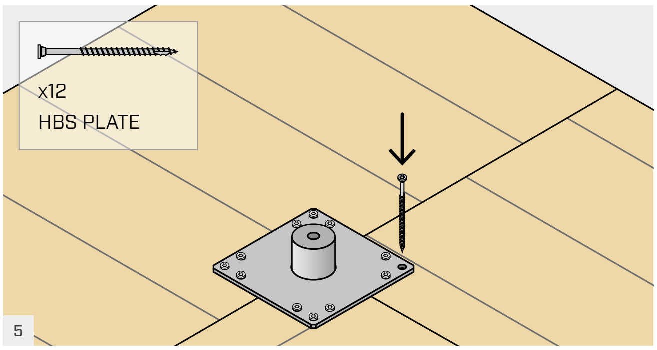
Insert the XYLOFON WASHER (optional) and/or the DISTRIBUTION PLATE (optional) on the cylinder.



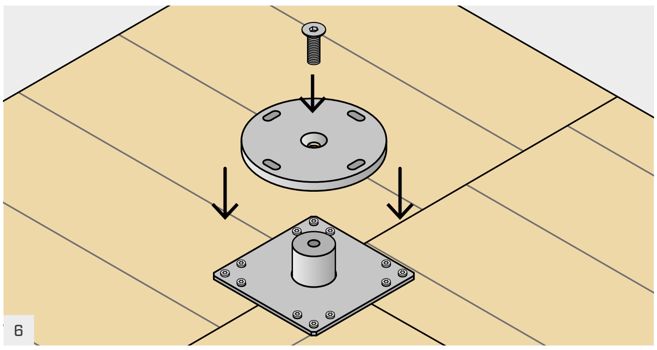
Fit the pre-drilled CLT panels with a circular hole of D_{CLT} diameter onto the cylinder. A compression reinforcement can be provided to the panel bottom of beam to increase strength.



Insert the FASTENING PLATE onto the cylinder.

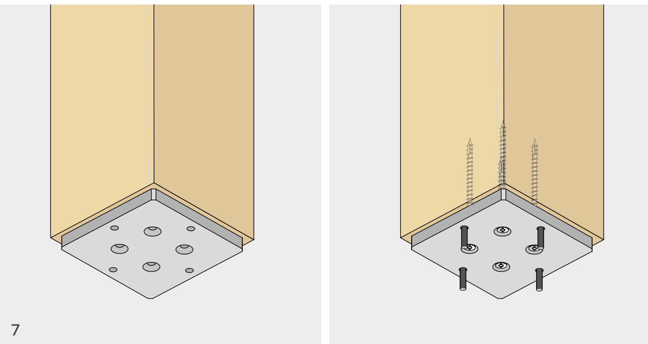


Connect the FASTENING PLATE to the CLT panels with 12 HBS PLATE 8x120 screws.



Place the DISC on the CYLINDER and fasten the countersunk head screw with a 10 or 12 mm male hexagonal wrench.

MOUNTING



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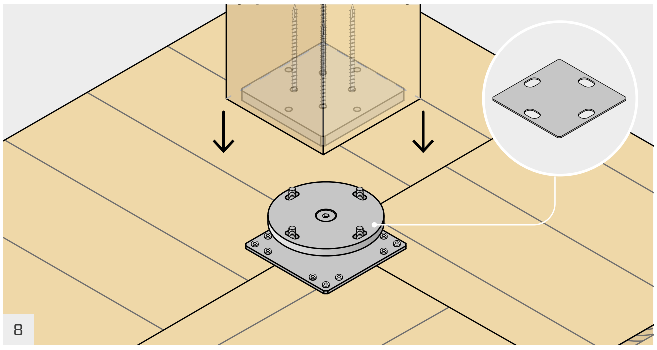
Fasten the upper plate to the lower face of the column using the VGS Ø11 screws, in accordance with the relevant installation instructions. The top plate is equipped with suitable threaded holes for fastening to the disc. If SPRODS are used, after positioning the plate on the upper column, they must be screwed in, taking care to mark the minimum pull-through length in the upper plate.



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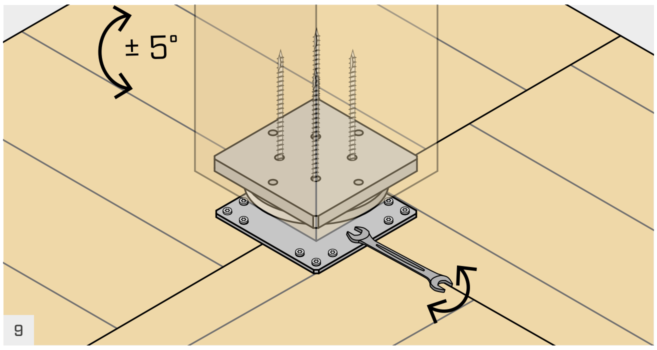
Place the upper column on the disc and fasten it using 4 SPBOLT1235 bolts with ULS125 washer. In the case of upper steel column, the upper plate must not be used and the column must be equipped with a suitable steel plate with holes for fastening the 4 SPBOLT1235 bolts.
In the event of a misalignment of the column set-up dimension, e.g. due to cutting tolerances, it is possible to compensate for this by means of the PILSHIM10 (1mm) or PILSHIM20 (2mm) shims, or a combination of these two.



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The slotted holes in the hexagonal disc allow the column to be rotated ±5°. Turn the column to the correct position and tighten the 4 SPBOLT1235 bolts or hex nuts of the SPRODS, using a side wrench.

CLT PANEL PRODUCTION AND INSTALLATION TOLERANCES

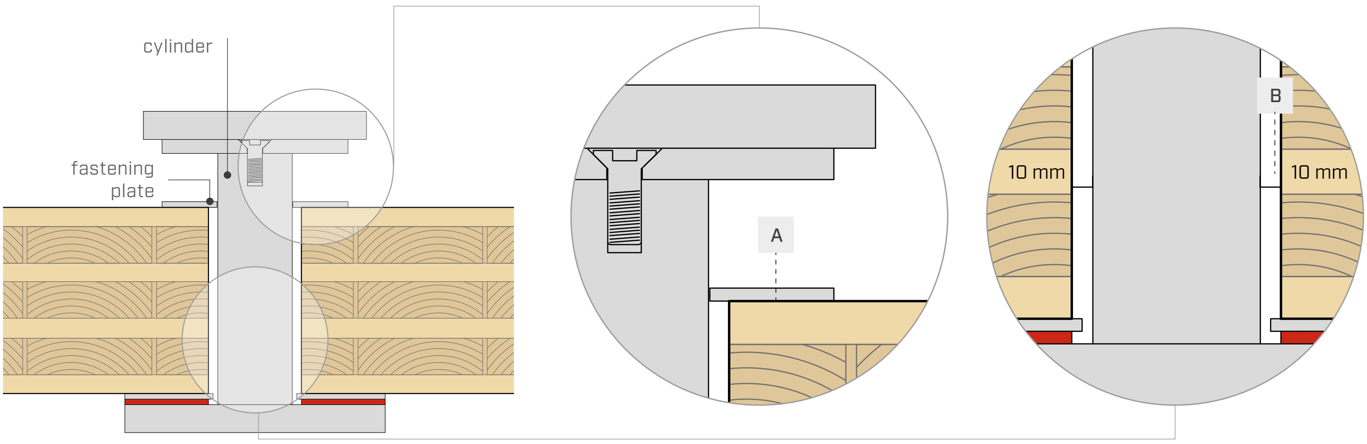
The connector is designed to adapt to CLT panel production and installation tolerances.

1. **PRODUCTION TOLERANCE ON CLT PANEL THICKNESS**

   If there is any tolerance on the thickness of the CLT floor, it is absorbed by the fastening plate (area A), which can slide on the steel cylinder.

   The total height of the PILLAR connector remains constant regardless of the CLT panel production tolerance.

2. **TOLERANCE OF ±10 mm ON THE FLOOR POSITIONING** (area B)

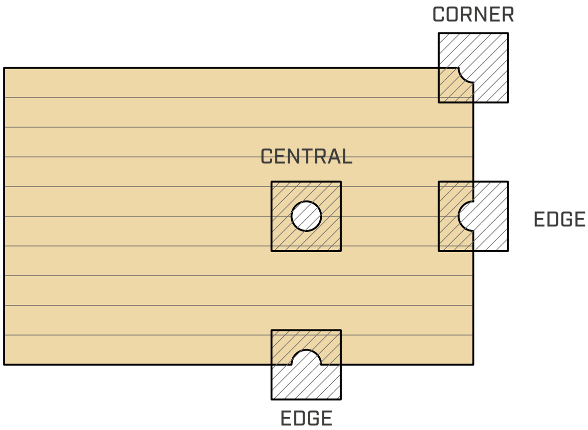


STRUCTURAL VALUES

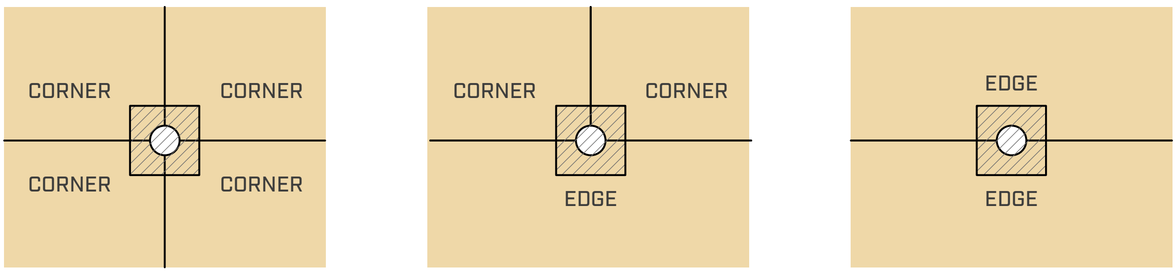
The PILLAR connector allows the columns to be positioned at a point inside the CLT panel (CENTRAL), on the edge of the CLT panel (EDGE) or on the corner of the panel (CORNER).
It is possible to combine different types of support on the same column. In this case, the verification with compression perpendicular to the fiber must be performed separately for each panel.
The following tables show all strength values for cases with and without reinforcement, depending on the thickness of the CLT panel.

The configurations shown in the images below are those indicated in ETA 19/0700. Other configurations can be studied in detail and offer higher strength values.

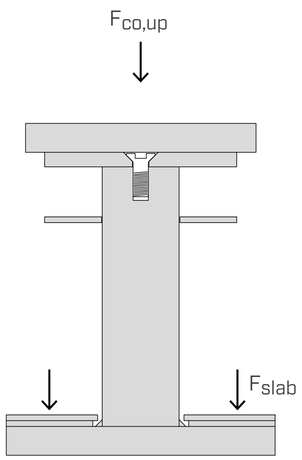
POSSIBLE SUPPORT CONFIGURATIONS



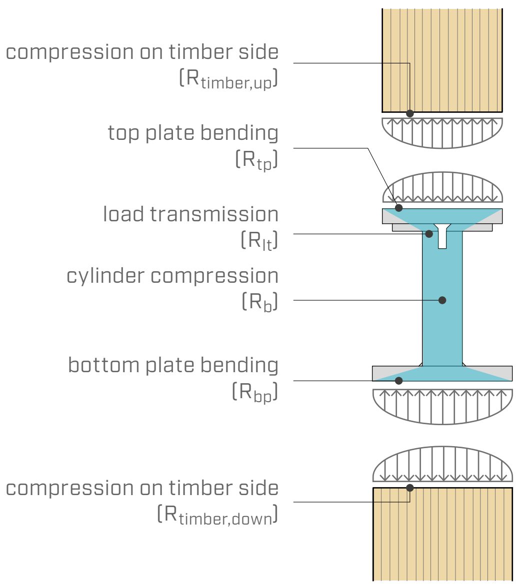
COMBINED SUPPORT CONFIGURATIONS



STRESSES ON THE CONNECTOR



FAILURE MECHANISMS AND VERIFICATIONS



PILLAR PIL60S

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	207	103	46	154	68	29
180	5	226	113	48	154	68	29
200	7	246	123	55	197	83	33
220 (11)	7	246	123	55	197	83	33
240	7	288	144	59	197	83	33
280 (12)	7	288	144	59	197	83	33
320 (12)	9	288	144	59	197	83	33

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$ [kN]	γ_{steel}
Top plate	$R_{tp,k}$ (5)	450	γ_{M0} (1)
Load transmission	$R_{lt,k}$	871	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	923	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (5)	690	γ_{M0} (1)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
C24	595	823
GL24h	680	941
GL28h	794	1097
GL32h (3)	907	1254

PILLAR PIL80S

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	261	131	58	219	96	41
180	5	283	141	60	219	96	41
200	7	305	153	69	281	118	48
220 (11)	7	305	153	69	281	118	48
240	7	352	176	73	281	118	48
280 (12)	7	352	176	73	281	118	48
320 (12)	9	352	176	73	281	118	48

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$ [kN]	γ_{steel}
Top plate	$R_{tp,k}$ (6)	994	γ_{M0} (1)
Load transmission	$R_{lt,k}$	1560	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	1634	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (6)	928	γ_{M0} (1)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
GL24h	959	1273
GL28h	1118	1485
GL32h (3)	1278	1697

PILLAR PIL80M

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	325	162	81	305	134	57
180	5	349	174	85	305	134	57
200	7	373	187	93	373	164	66
220(11)	7	373	187	93	373	164	66
240	7	425	212	104	391	164	66
280(12)	7	425	212	104	391	164	66
320(12)	9	425	212	104	391	164	66

STRENGTH ON STEEL SIDE

Controls		strength	
		$R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$(6)	1804	γ_{M0}*(2)
Load transmission	$R_{lt,k}$	1560	γ_{M0}(1)
Cylinder compression	$R_{b,k}$(8)	1634	γ_{M0}(1)
Bottom plate	$R_{bp,k}$(6)	1777	γ_{M0}*(2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$	$R_{timber,down,k}$
	[kN]	[kN]
GL24h	1273	1426
GL28h	1485	1663
GL32h(3)	1697	1901

PILLAR PIL80L

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	325	162	81	305	134	57
180	5	349	174	85	305	134	57
200	7	373	187	93	373	164	66
220(11)	7	373	187	93	373	164	66
240	7	425	212	104	391	164	66
280(12)	7	425	212	104	391	164	66
320 12)	9	425	212	104	391	164	66

STRENGTH ON STEEL SIDE

Controls		strength	
		$R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$(6)	2350	γ_{M0}*(2)
Load transmission	$R_{lt,k}$	1560	γ_{M0}(1)
Cylinder compression	$R_{b,k}$(8)	1634	γ_{M0}(1)
Bottom plate	$R_{bp,k}$(6)	2350	γ_{M0}*(2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$	$R_{timber,down,k}$
	[kN]	[kN]
GL24h	1802	1802
GL28h	2102	2102
GL32h(3)	2402	2402

PILLAR PIL100S

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	253	126	55	203	89	38
180	5	274	137	57	203	89	38
200	7	297	148	65	260	109	44
220 (11)	7	297	148	65	260	109	44
240	7	343	172	69	260	109	44
280 (12)	7	343	172	69	260	109	44
320 (12)	9	343	172	69	260	109	44

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$ (7)	1709	γ_{M0}*(2)
Load transmission	$R_{lt,k}$	2365	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	2474	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (7)	2498	γ_{M0}*(2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
GL28h	1330	1776
GL32h	2280	3381
LVL GL75 (4)	2280	3381

PILLAR PIL100M

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	316	158	79	289	127	54
180	5	340	170	82	289	127	54
200	7	365	182	91	365	155	63
220 (11)	7	365	182	91	365	155	63
240	7	416	208	101	370	155	63
280 (12)	7	416	208	101	370	155	63
320 (12)	9	416	208	101	370	155	63

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$ (7)	2429	γ_{M0}*(2)
Load transmission	$R_{lt,k}$	2365	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	2474	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (7)	2429	γ_{M0}*(2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
GL28h	1861	1861
GL32h	2127	2127
LVL GL75 (4)	3748	3748

PILLAR PIL120S

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	306	158	76	270	118	50
180	5	330	165	79	270	118	50
200	7	354	177	89	346	145	59
220 (11)	7	354	177	89	346	145	59
240	7	406	203	96	346	145	59
280 (12)	7	406	203	96	346	145	59
320 (12)	9	406	203	96	346	145	59

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$ [kN]	γ_{steel}
Top plate	$R_{tp,k}$ (7)	3067	γ_{M0}* (2)
Load transmission	$R_{lt,k}$	3234	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	3336	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (7)	3067	γ_{M0}* (2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
GL28h	1991	1991
GL32h	2276	2276
LVL GL75 (4)	4311	4311

PILLAR PIL120M

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	306	153	76	270	118	50
180	5	330	165	79	270	118	50
200	7	354	177	89	346	145	59
220 (11)	7	354	177	89	346	145	59
240	7	406	203	96	346	145	59
280 (12)	7	406	203	96	346	145	59
320 (12)	9	406	203	96	346	145	59

STRENGTH ON STEEL SIDE

Controls		strength $R_{steel,k}$ [kN]	γ_{steel}
Top plate	$R_{tp,k}$ (7)	3976	γ_{M0}* (2)
Load transmission	$R_{lt,k}$	3234	γ_{M0} (1)
Cylinder compression	$R_{b,k}$ (8)	3336	γ_{M0} (1)
Bottom plate	$R_{bp,k}$ (7)	3976	γ_{M0}* (2)

STRENGTH ON TIMBER SIDE

Strength class	$R_{timber,up,k}$ [kN]	$R_{timber,down,k}$ [kN]
GL28h	2188	2188
GL32h	2501	2501
LVL GL75 (4)	5101	5101

PILLAR PIL100L

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	316	158	79	289	127	54
180	5	340	170	82	289	127	54
200	7	365	182	91	365	155	63
220(11)	7	365	182	91	365	155	63
240	7	416	208	101	370	155	63
280(12)	7	416	208	101	370	155	63
320(12)	9	416	208	101	370	155	63

STRENGTH ON STEEL SIDE

Controls		strength	
		$R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$(9)	-	-
Load transmission	$R_{lt,k}$	4880	γ_{M0}*(2)
Cylinder compression	$R_{b,k}$(8)	5084	γ_{M0}*(2)
Bottom plate	$R_{bp,k}$(10)	-	-

PILLAR PIL120L

COMPRESSIVE STRENGTH PERPENDICULAR TO THE FIBER FOR THE CLT FLOOR

CLT panel		$R_{slab,k}$ [kN]					
t_{CLT}	layers	with reinforcement			without reinforcement		
[mm]		central	edge	angle	central	edge	angle
160	5	306	153	76	270	118	50
180	5	330	165	79	270	118	50
200	7	354	177	89	346	145	59
220(11)	7	354	177	89	346	145	59
240	7	406	203	96	346	145	59
280(12)	7	406	203	96	346	145	59
320(12)	9	406	203	96	346	145	59

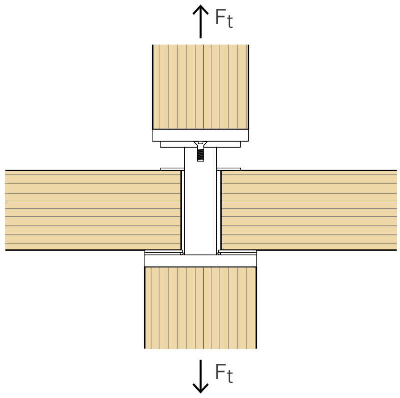
STRENGTH ON STEEL SIDE

Controls		strength	
		$R_{steel,k}$	
		[kN]	γ_{steel}
Top plate	$R_{tp,k}$(9)	-	-
Load transmission	$R_{lt,k}$	6030	γ_{M0}*(2)
Cylinder compression	$R_{b,k}$(8)	6220	γ_{M0}*(2)
Bottom plate	$R_{bp,k}$(10)	-	-

TENSILE STRENGTH

VALUES VALID FOR ALL PILLAR MODELS

Upper/lower column screws	$F_{t,k}$			
	C24[13]	GL24h[14]	GL28h[15]	GL32h[16]
[pcs - ØxL]	[kN]	[kN]	[kN]	[kN]
4 VGS Ø11x250	34,60	37,32	40.38	41.54
4 VGS Ø11x400	56,20	60,65	65.64	67.49



NOTES:

(1) The coefficient γ_{M0} corresponds to the partial coefficient for steel S355 sections strength and it should be taken according to the current regulations used for the calculation. For example, according to EN 1995-1-1 it is to be considered as 1,00.

(2) The coefficient γ_{M0}* corresponds to the partial coefficient for steels section strength not covered by EN 1993-1-1. This should be taken according to the current regulations used for the calculation. In the absence of normative indications, it is recommended to use a value γ_{M0}*=1,10.

(3) The PILLAR connector model in question is optimized for use with GL32h glulam columns. Use of materials with inferior characteristics leads to overdimensioning of the connector metal components.

(4) The PILLAR connector model in question is optimized for use with LVL GL75 timber columns in accordance with ETA-14/0354. Use of materials with inferior characteristics leads to overdimensioning of the connector metal components.

(5) For safety reasons, the strength is calculated using a k_{steel} coefficient valid for timber columns C24. The same value can be used for GL24h, GL28h and GL32h columns.

(6) The strength is calculated using a k_{steel} coefficient valid for GL32h timber columns. If other materials are used for columns, the strength must be calculated with reference to ETA-19/0700.

(7) The strength is calculated using a k_{steel} coefficient valid for GL75 timber columns. If other materials are used for columns, the strength must be calculated with reference to ETA-19/0700.

(8) The compressive strength of the cylinder has been calculated for a panel height of 280 mm. In all other cases, the same value can be used for safety purposes.

(9) The connector is supplied without top plate. The steel column can be connected directly to the PILLAR connector through 4 M12 bolts. The top column must be equipped with a plate, dimensioned by the designer, suitable to transfer the load to the PILLAR connector.

(10) The bottom plate of the PILLAR connector is not dimensioned to spread the load on the lower steel column. This must be equipped with a plate, dimensioned by the designer, suitable to receive the load from the PILLAR connector.

(11) The strength values for 220 mm thick CLT slabs are not indicated in ETA-19/0700. For safety reasons, the table shows the values provided for 200 mm thick floors.

(12) The strength values for 280 mm and 320 mm thick CLT slabs are not indicated in ETA-19/0700. For safety reasons, it is recommended to use the values provided for 240 mm thick floors. .

(13) Values calculated according to ETA-11/0030. A C24 solid timber column with ρ_k = 350 kg/m^3 has been considered in the calculation.

(14) Values calculated according to ETA-11/0030. A GL24h glulam column with ρ_k = 385 kg/m^3 has been considered in the calculation.

(15) Values calculated according to ETA-11/0030. A GL28h glulam column with ρ_k = 425 kg/m^3 has been considered in the calculation.

(16) Values calculated according to ETA-11/0030. A GL32h glulam column with ρ_k = 440 kg/m^3 has been considered in the calculation.

GENERAL PRINCIPLES:

- For t_{CLT} panel thickness intermediate to those listed in the table, it is recommended to use the $F_{slab,k}$ strength values provided for the lower thickness.
- The design values on timber side can be obtained from the characteristic values as follows. The coefficients γ_M,γ_{MT} and k_{mod} should be taken according to the current regulations used for the calculation. The γ_M coefficient is the relevant safety coefficient on connection side while the γ_{MT} coefficient is the relevant safety coefficient on timber side.

$$R_{slab,d} = \frac{R_{slab,k} \cdot k_{mod}}{\gamma_M} \qquad R_{t,d} = \frac{R_{t,k} \cdot k_{mod}}{\gamma_M}$$

$$R_{timber,up,d} = \frac{R_{timber,up,k} \cdot k_{mod}}{\gamma_{MT}}$$

$$R_{timber,down,d} = \frac{R_{timber,down,k} \cdot k_{mod}}{\gamma_{MT}}$$

- The design values on steel side can be obtained from the characteristic values as follows. The coefficients γ_{steel} should be taken according to the current regulations used for the calculation (see notes 1 and 2).

$$R_{tp,d} = \frac{R_{tp,k}}{\gamma_{steel}} \qquad R_{lt,d} = \frac{R_{lt,k}}{\gamma_{steel}}$$

$$R_{b,d} = \frac{R_{b,k}}{\gamma_{steel}} \qquad R_{bp,d} = \frac{R_{bp,k}}{\gamma_{steel}}$$

- The following expressions must be fulfilled for the verifications:

$$\frac{F_{slab,d}}{R_{slab,d}} \leq 1,0$$

$$\frac{F_{co,up,d}}{min\left\{R_{timber,up,d}\,;\,R_{tp,d}\,;\,R_{lt,d}\,;\,R_{b,d}\,;\,R_{bp,d}\right\}} \leq 1,0$$

$$\frac{F_{co,up,d} + F_{slab,d}}{R_{timber,down,d}} \leq 1,0$$

$$\frac{F_{t,d}}{R_{t,d}} \leq 1,0$$

- The compression strength perpendicular to the fiber in the floor ($F_{slab,d}$) does not include the shear and rolling shear strength of the CLT panel in the area affected by the presence of the support. The floor at the Ultimate Limit State and the Service Limit State must be verified separately.
- The checks on the column side refer to the compressive strength parallel to the fiber, at the PILLAR connector. Column instability must be verified separately.