WHT PLATE C CONCRETE

PLATE FOR TENSILE LOADS

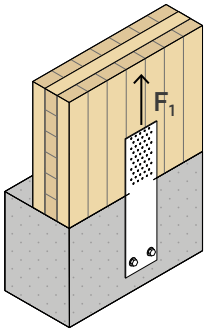
UK CA EN 14545 CE EN 14545

SERVICE CLASS SC1 SC2

MATERIAL

DX51D Z275 DX51D + Z275 carbon steel

EXTERNAL LOADS



TWO VERSIONS

WHT PLATE 440, ideal for platform frame structures; WHT PLATE 540, ideal for CLT panel structures.

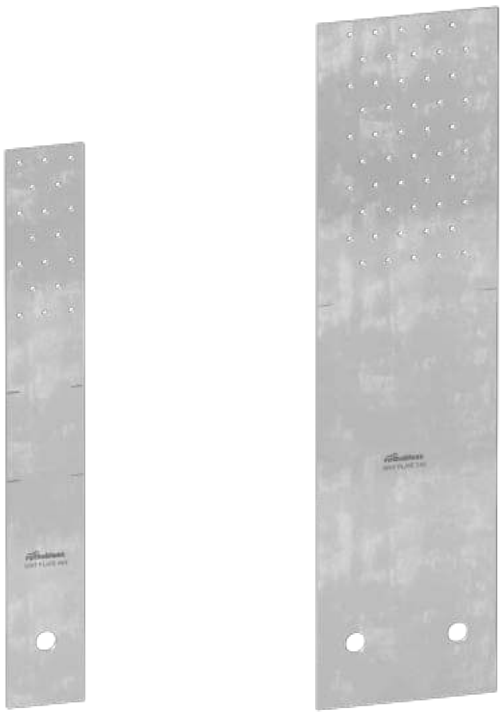
LIGHT TIMBER FRAME

The new partial nailing for the WHTPLATE440 model is optimal for frame walls with a thickness of 60 mm.

QUALITY

The high tensile strength allows to optimize the number of plates installed, ensuring remarkable time saving.
Values calculated and certified according to CE marking.

USA, Canada and more design values available online.

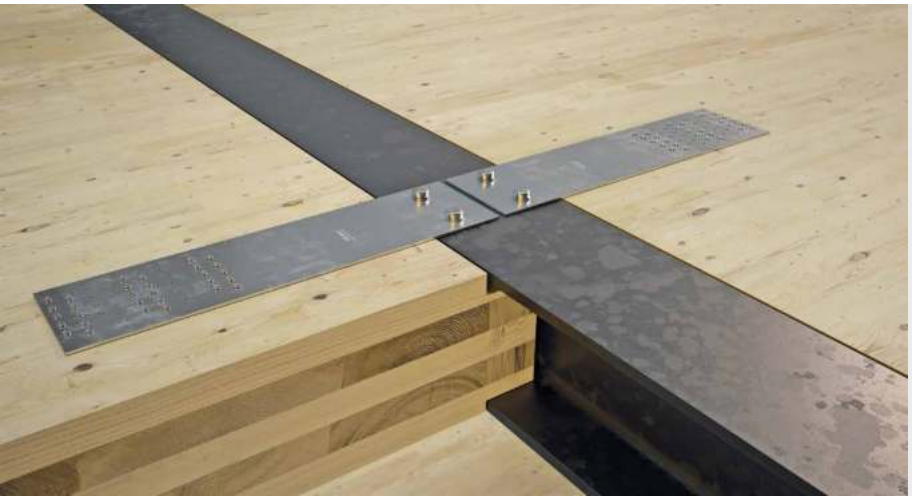


FIELDS OF USE

Tensile joints for timber walls.
Timber-to-concrete or timber to-steel configurations.
Suitable for walls aligned to the concrete edge.

Can be applied to:

- solid timber and glulam
- timber frame
- CLT and LVL panels



TIMBER-TO-CONCRETE

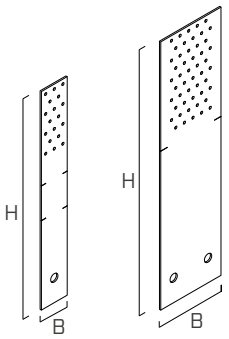
Beside its natural function, it is ideal for solving situations where the transfer of tensile loads from timber to concrete is required.

HYBRID STRUCTURES

Within hybrid timber-to-steel structures, it can be used for tensile connections by simply aligning the edge of the timber with the edge of the steel element.

CODES AND DIMENSIONS

CODE	B [mm]	H [mm]	holes [mm]	s [mm]	*B [in]*	*H [in]*	*holes [in]*	*s [in]*	n_V Ø5 *n_V Ø.20* [pcs]		pcs
WHTPLATE440	60	440	Ø17	3	*2 3/8*	*17 1/4*	*Ø0.67*	*0.12*	18	●	10
WHTPLATE540	140	540	Ø17	3	*5 1/2*	*21 1/4*	*Ø0.67*	*0.12*	50	●	10

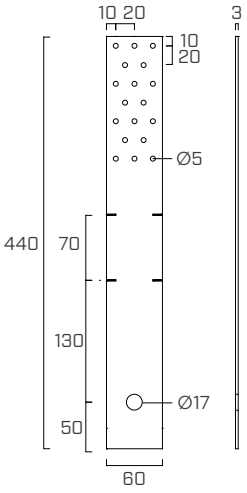


FASTENERS

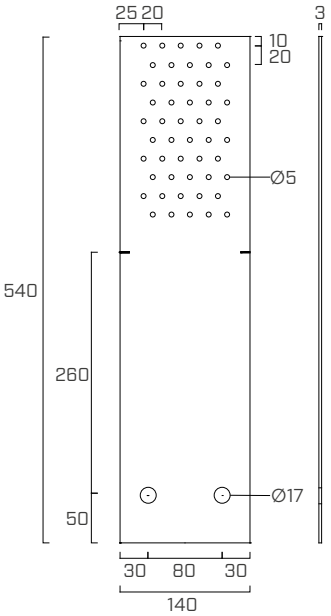
type	description		d [mm]	support	page
LBA	high bond nail		4		570
LBS	round head screw		5		571
AB1	CE1 expansion anchor		16		536
VIN-FIX	vinyl ester chemical anchor		M16		545
HYB-FIX	hybrid chemical anchor		M16		552
KOS	hexagonal head bolt		M16		168

GEOMETRY

WHTPLATE440



WHTPLATE540

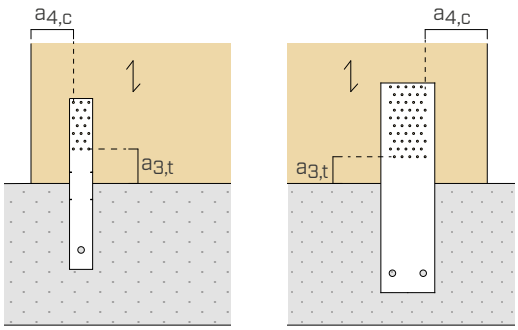


INSTALLATION

MINIMUM DISTANCES

TIMBER minimum distances			nails LBA Ø4	screws LBS Ø5
C/GL	$a_{4,c}$	[mm]	≥ 20	≥ 25
	$a_{3,t}$	[mm]	≥ 60	≥ 75
CLT	$a_{4,c}$	[mm]	≥ 12	≥ 12,5
	$a_{3,t}$	[mm]	≥ 40	≥ 30

- C/GL: minimum distances for solid timber or glulam consistent with EN 1995:2014 according to ETA considering a timber density $\rho_k \leq 420$ kg/m^3
- CLT: minimum distances for Cross Laminated Timber according to ÖNORM EN 1995:2014 (Annex K) for nails and ETA-11/0030 for screws



FASTENING PATTERNS

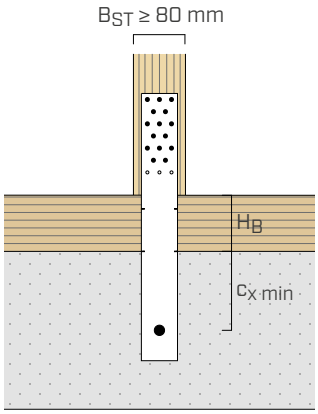
WHTPLATE440

The WHT PLATE 440 can be used for different construction systems (CLT/timber frame) and ground connection systems (with/without platform beam, with/without grout). Depending on the presence and dimension of H_B of the intermediate layer, in accordance with the minimum distances of the timber and concrete fasteners, the WHT PLATE 440 must be positioned in way that the anchor is at a distance from the concrete edge:

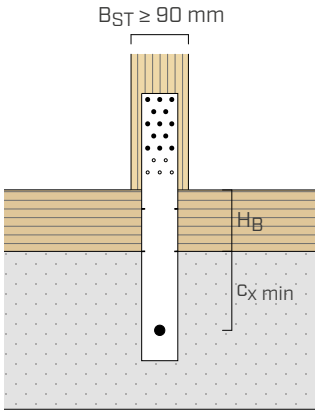
$$130 \text{ mm} \leq c_x \leq 200 \text{ mm}$$

INSTALLATION ON TIMBER FRAME

wide pattern

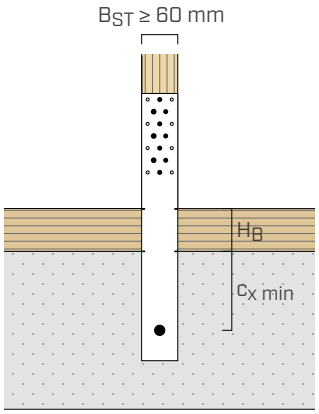


15 fasteners
LBA Ø4 x 60

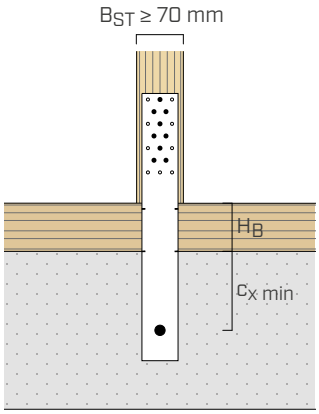


13 fasteners
LBS Ø5 x 60

narrow pattern



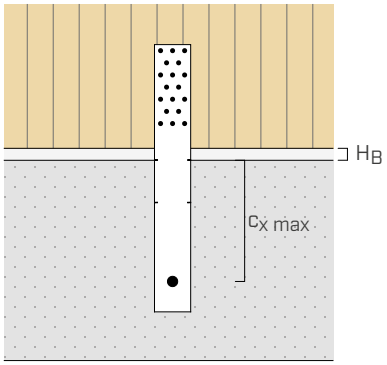
10 fasteners
LBA Ø4 x 60



9 fasteners
LBS Ø5 x 60

INSTALLATION ON CLT

wide pattern



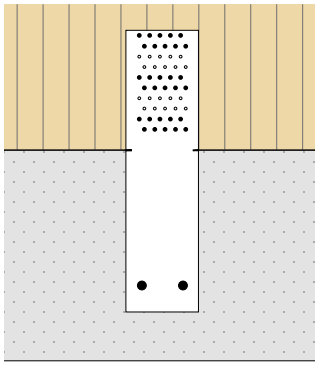
18 fasteners
LBA Ø4 x 60 | LBS Ø5 x 60

c_x [mm]
$c_{x\,min}$ = 130
$c_{x\,max}$ = 200

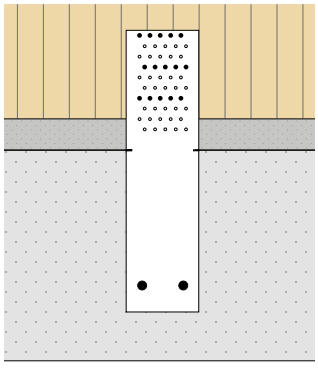
It is possible to install the angle bracket in two specific patterns:
- **wide pattern**: installation of connectors on all columns of the vertical flange;
- **narrow pattern**: installation with narrow nailing, leaving the outermost columns free.

WHTPLATE540

INSTALLATION ON CLT



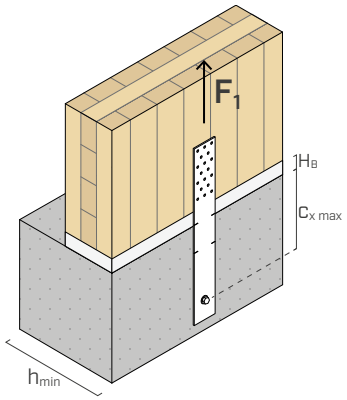
30 fasteners
partial fastening
LBA Ø4 x 60 | LBS Ø5 x 60

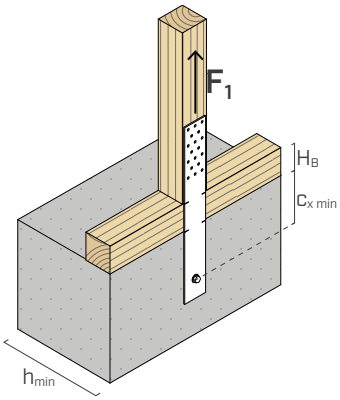


15 fasteners
partial fastening
LBA Ø4 x 60 | LBS Ø5 x 60

In the presence of design requirements such as varying stress values or the presence of a **grout** between the wall and the support surface, it is possible to use pre-calculated and optimised **partial nailing** in order to influence the effective n_{ef} number of fastenings on timber. Alternative nailings are possible in accordance with the minimum distances for the connectors.

STRUCTURAL VALUES | **WHTPLATE440** | TIMBER-TO-CONCRETE| F_1





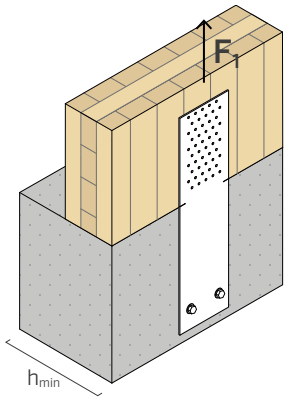
MINIMUM CONCRETE THICKNESS hmin ≥ 200 mm

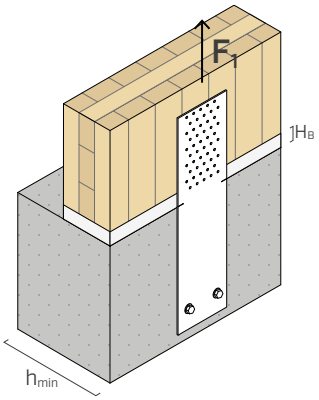
		TIMBER				STEEL		CONCRETE					
configuration	**pattern**	**fastening holes Ø5**			**$R_{1,k\ timber}$**	**$R_{1,k\ steel}$**		**$R_{1,d}$ uncracked**		**$R_{1,d}$ cracked**		**$R_{1,d}$ seismic**	
		Ø x L	**n_V**	**$H_{B\ max}$**				VIN-FIX 5.8 **Ø x L**		VIN-FIX 5.8 **Ø x L**		HYB-FIX 8.8 **Ø x L**	
		[mm]	[pcs]	[mm]	[kN]	[kN]	γ_{steel}	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
$c_{x\ max}$ = 200 mm	wide pattern	LBA Ø4 x 60	18	20	**39,6**	**34,8**	γ_{M2}	M16 x 195	**32,3**	M16 x 195	**22,9**	M16 x 195	**22,9**
		LBS Ø5 x 60	18	30	**31,8**								
$c_{x\ min}$ = 130 mm	wide pattern	LBA Ø4 x 60	15	90	**34,0**	**34,8**	γ_{M2}	M16 x 195	**22,6**	M16 x 195	**16,0**	M16 x 195	**16,0**
		LBS Ø5 x 60	13	95	**24,5**								
$c_{x\ min}$ = 130 mm	narrow pattern	LBA Ø4 x 60	10	70	**22,3**	**34,8**	γ_{M2}	M16 x 195	**22,6**	M16 x 195	**16,0**	M16 x 195	**16,0**
		LBS Ø5 x 60	9	75	**17,5**								

MINIMUM CONCRETE THICKNESS h_{min} ≥ 150 mm

		TIMBER				STEEL		CONCRETE					
configuration	**pattern**	**fastening holes Ø5**			**$R_{1,k\ timber}$**	**$R_{1,k\ steel}$**		**$R_{1,d}$ uncracked**		**$R_{1,d}$ cracked**		**$R_{1,d}$ seismic**	
		Ø x L	**n_V**	**$H_{B\ max}$**				VIN-FIX 5.8 **Ø x L**		VIN-FIX 5.8 **Ø x L**		HYB-FIX 8.8 **Ø x L**	
		[mm]	[pcs]	[mm]	[kN]	[kN]	γ_{steel}	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
$c_{x\ max}$ = 200 mm	wide pattern	LBA Ø4 x 60	18	20	**39,6**	**34,8**	γ_{M2}	M16 x 130	**26,0**	M16 x 130	**18,4**	M16 x 130	**18,4**
		LBS Ø5 x 60	18	30	**31,8**								
$c_{x\ min}$ = 130 mm	wide pattern	LBA Ø4 x 60	15	90	**34,0**	**34,8**	γ_{M2}	M16 x 130	**18,2**	M16 x 130	**12,9**	M16 x 130	**12,9**
		LBS Ø5 x 60	13	95	**24,5**								
$c_{x\ min}$ = 130 mm	narrow pattern	LBA Ø4 x 60	10	70	**22,3**	**34,8**	γ_{M2}	M16 x 130	**18,2**	M16 x 130	**12,9**	M16 x 130	**12,9**
		LBS Ø5 x 60	9	75	**17,5**								

STRUCTURAL VALUES | **WHTPLATE540** | TIMBER-TO-CONCRETE| F_1





MINIMUM CONCRETE THICKNESS hmin ≥ 200 mm

configuration	pattern	TIMBER				STEEL		CONCRETE[2]					
		fastening holes Ø5			$R_{1,k\ timber}$	$R_{1,k\ steel}$		$R_{1,d\ uncracked}$		$R_{1,d\ cracked}$		$R_{1,d\ seismic}$	
		Ø x L	n_V	$H_{B\ max}$				VIN-FIX 5.8 Ø x L		VIN-FIX 5.8 Ø x L		HYB-FIX 8.8 Ø x L	
		[mm]	[pcs]	[mm]	[kN]	[kN]	γ_{steel}	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
partial fastening[1] 2 anchors M16	30 fasteners	LBA Ø4 x 60	30	-	**84,9**	**70,6**	γ_{M2}	M16 x 195	**44,1**	M16 x 195	**31,3**	M16 x 195	**26,6**
		LBS Ø5 x 60	30	10	**69,9**								
partial fastening[1] 2 anchors M16	15 fasteners	LBA Ø4 x 60	15	60	**42,5**	**70,6**	γ_{M2}	M16 x 195	**44,1**	M16 x 195	**31,3**	M16 x 195	**26,6**
		LBS Ø5 x 60	15	70	**35,0**								

MINIMUM CONCRETE THICKNESS hmin ≥ 150 mm

configuration	pattern	TIMBER				STEEL		CONCRETE[2]					
		fastening holes Ø5			$R_{1,k\ timber}$	$R_{1,k\ steel}$		$R_{1,d\ uncracked}$		$R_{1,d\ cracked}$		$R_{1,d\ seismic}$	
		Ø x L	n_V	$H_{B\ max}$				VIN-FIX 5.8 Ø x L		VIN-FIX 5.8 Ø x L		HYB-FIX 8.8 Ø x L	
		[mm]	[pcs]	[mm]	[kN]	[kN]	γ_{steel}	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
partial fastening[1] 2 anchors M16	30 fasteners	LBA Ø4 x 60	30	-	**84,9**	**70,6**	γ_{M2}	M16 x 130	**35,9**	M16 x 130	**25,4**	M16 x 130	**21,6**
		LBS Ø5 x 60	30	10	**69,9**								
partial fastening[1] 2 anchors M16	15 fasteners	LBA Ø4 x 60	15	60	**42,5**	**70,6**	γ_{M2}	M16 x 130	**35,9**	M16 x 130	**25,4**	M16 x 130	**21,6**
		LBS Ø5 x 60	15	70	**35,0**								

NOTES

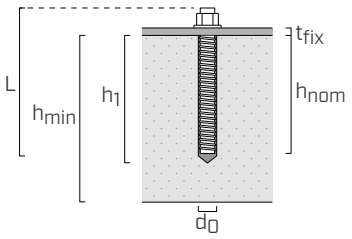
[1] In the case of configurations with partial nailing, the strength values in the table are valid for the installation of fasteners in timber in accordance with $a_1 > 10d$ ($n_{ef} = n$).

[2] The concrete strength values are valid if the assembly notches of the WHT-PLATE540 plate are positioned at the timber-to-concrete interface (c_x = 260 mm).

ANCHORS INSTALLATION PARAMETERS

anchor type		t_{fix}	$h_{nom} = h_{ef}$	h_1	d_0	h_{min}
type	**Ø x L** [mm]	[mm]	[mm]	[mm]	[mm]	[mm]
VIN-FIX 5.8	M16 x 130	3	110	115	18	150
HYB-FIX 8.8	M16 x 195	3	164	170		200

Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.



t_{fix}	fastened plate thickness
h_{nom}	nominal anchoring depth
h_1	minimum hole depth
d_0	hole diameter in the concrete support
h_{min}	concrete minimum thickness

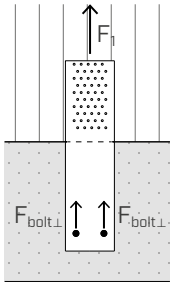
DIMENSIONING OF ALTERNATIVE ANCHORS

Fastening elements to the concrete through anchors not listed in the table, shall be verified according to the load acting on the anchors, which can be evaluated through the $k_{t\perp//}$ coefficients. The lateral shear load acting on the anchor can be obtained as follows:

$$F_{bolt\perp,d} = k_{t\perp} \cdot F_{1,d}$$

$k_{t\perp}$	coefficient of eccentricity
F_1	tensile stress acting on the WHT PLATE

The anchor check is satisfied if the design tensile strength, obtained considering the boundary effects, is greater than the design external load: $R_{bolt\ \perp,d} \geq F_{bolt\ \perp,d}$.



	$k_{t\perp}$
WHTPLATE440	1,00
WHTPLATE540	0,50

GENERAL PRINCIPLES

- Characteristic values according to EN 1995:2014.
- Design values can be obtained from characteristic values as follows:

$$R_d = min \begin{cases} \frac{R_{k,\ timber} \cdot k_{mod}}{\gamma_M} \\ \frac{R_{k,\ steel}}{\gamma_{M2}} \\ R_{d,\ concrete} \end{cases}$$

  The coefficients k_{mod}, γ_M and γ_{M2} should be taken according to the current regulations used for the calculation.
- The timber strength values $R_{1,k\ timber}$ are calculated considering the effective number according to Table 8.1 (EN 1995:2014).
- The calculation process used a timber characteristic density of ρ_k = 350 kg/m^3 and C25/30 concrete with a thin reinforcing layer and minimum thickness indicated in the relative tables.
- Concrete design strength values are supplied for uncracked ($R_{1,d\ uncracked}$), cracked ($R_{1,d\ cracked}$) concrete and in case of seismic verification ($R_{1,d\ seismic}$) for use of chemical anchor with threaded rod in steel class 8.8.
- Seismic design in performance category C2, without ductility requirements on anchors (option a2 and elastic design according to EN 1992:2018). For chemical anchors it is assumed that the annular space between the anchor and the plate hole is filled (α_{gap} = 1).
- The strength values are valid for the calculation hypothesis defined in the table; for boundary conditions different from the ones in the table (e.g. minimum distances from the edge), the concrete anchor group can be verified using MyProject calculation software according to the design requirements.
- Dimensioning and verification of timber and concrete elements must be carried out separately.
- The product ETAs for the anchors used in the concrete-side strength calculation are indicated below:
  - VIN-FIX chemical anchor according to ETA-20/0363
  - HYB-FIX chemical anchor according to ETA-20/1285