WHT PLATE C CONCRETE

PLATE FOR TENSILE LOADS

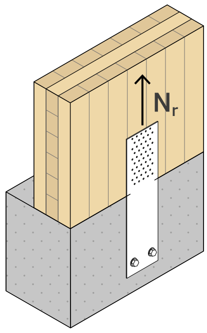
UK CA EN 14545 | CE EN 14545

SERVICE CONDITION: DRY

MATERIAL

DX51D Z275 — DX51D + Z275 carbon steel

EXTERNAL LOADS

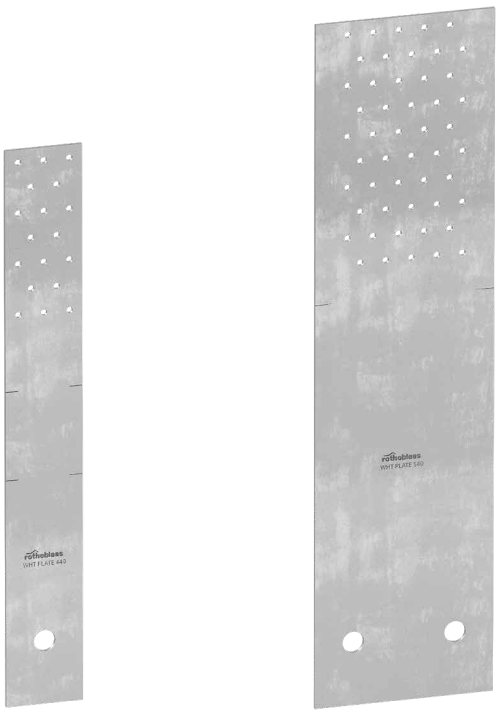


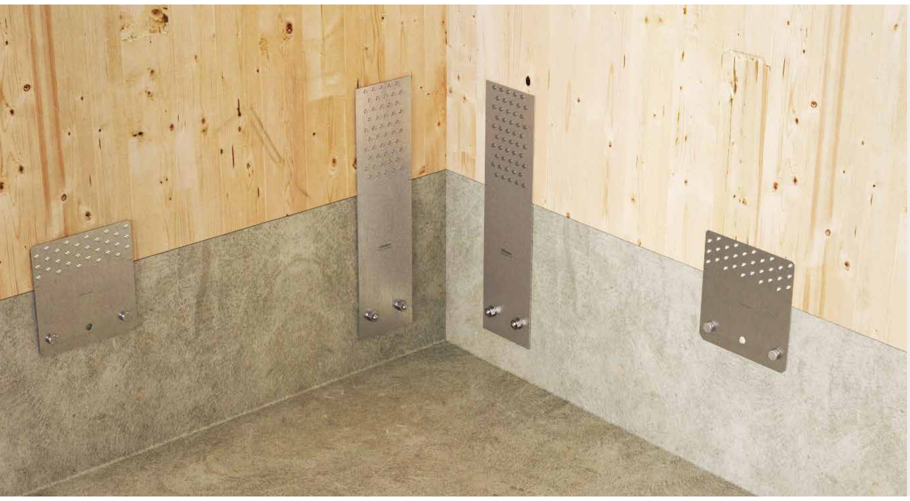
TWO VERSIONS
WHT PLATE 440, ideal for platform frame structures; WHT PLATE 540, ideal for CLT panel structures.

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.

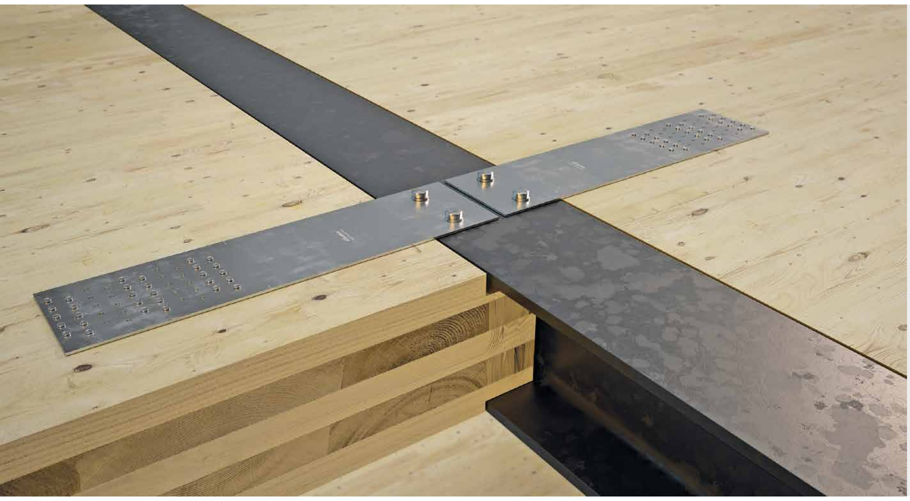
CANADIAN DESIGN VALUES
USA, EU and more design values available online.





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

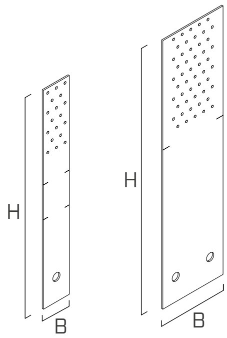
Beside its natural function, it is ideal for solving situations where the transfer of tensile loads from timber to concrete is required.

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]	concrete	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

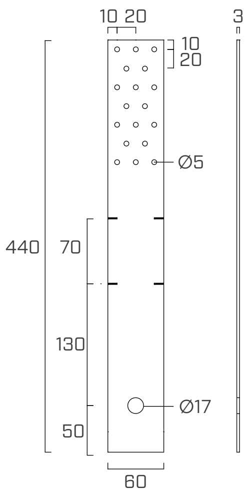


FASTENERS

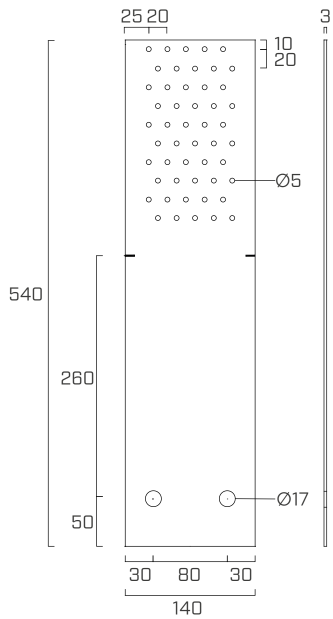
type	description		d [mm]	support
LBA	high bond nail		4	timber
LBS	round head screw		5	timber
AB1	CE1 expansion anchor		16	concrete
VIN-FIX	vinyl ester chemical anchor		M16	concrete
HYB-FIX	hybrid chemical anchor		M16	concrete
KOS	hexagonal head bolt		M16	timber / steel

GEOMETRY

WHTPLATE440



WHTPLATE540

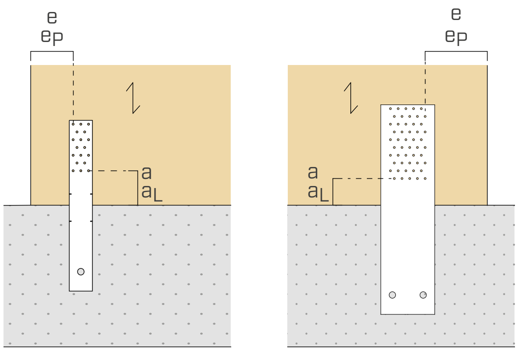


INSTALLATION

MINIMUM DISTANCES | LBA

TIMBER minimum distances			**nails LBA Ø4**	
			spruce-pine-fir and northern species	**douglas fir-larch, hem-fir, and western red cedar**
timber	**e**	[mm]	≥ 16	≥ 20
	a	[mm]	≥ 48	≥ 60

TIMBER minimum distances			**screws LBA Ø5**		
			not pre-drilled		**pre-drilled**
			G ≤ 0.44	**0.44< G ≤ 0.5**	**any G**
timber	**e_P**	[mm]	≥ 25	≥ 35	≥ 15
	a_L	[mm]	≥ 75‡	≥ 110	≥ 60†



G = mean relative density of wood

†For Douglas Fir-Larch and Western Red Cedar, this minimum spacing shall be increased by 50%.

‡For Western Red Cedar, this minimum spacing shall be increased by 50%.

FASTENING PATTERNS

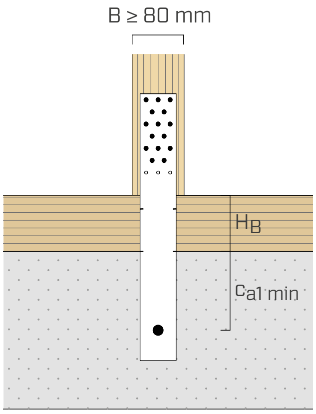
WHTPLATE440

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 distance from the anchor to the concrete edge, 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:

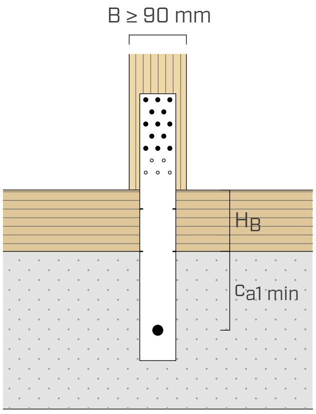
$$130 \text{ mm} \leq c_{a1} \leq 200 \text{ mm}$$

INSTALLATION ON TIMBER FRAME

wide pattern

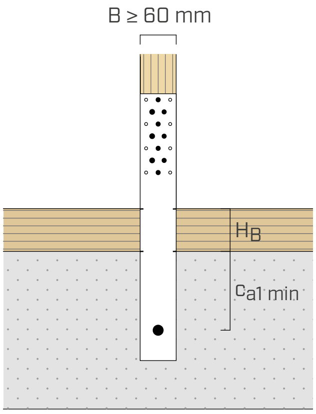


15 fasteners
LBA Ø4 x 60

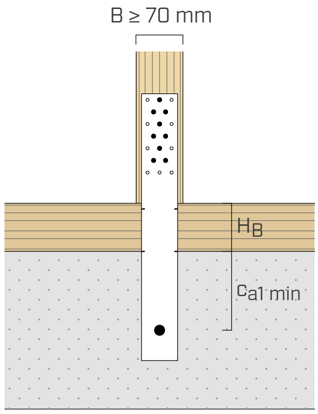


13 fasteners
LBS Ø5 x 60

narrow pattern



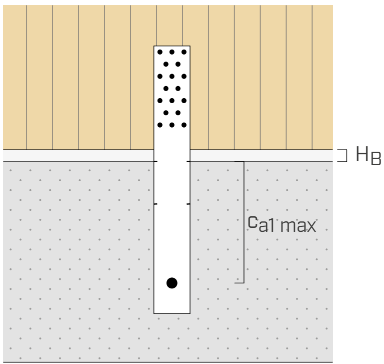
10 fasteners
LBA Ø4 x 60



9 fasteners
LBS Ø5 x 60

INSTALLATION ON CLT

wide pattern



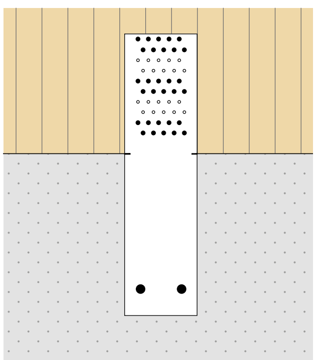
18 fasteners
LBA Ø4 x 60 | LBS Ø5 x 60

c_{a1} [mm]
$c_{a1\ min}$ = 130
$c_{a1\ max}$ = 200

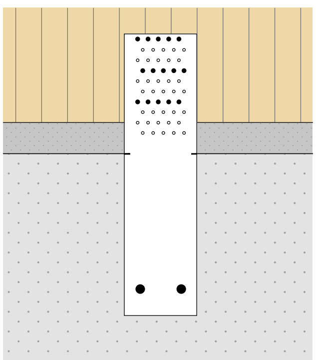
It is possible to install the angle bracket in two specific patterns:
- **wide pattern**: installation of connectors on all columns of the vertical flange;
- **narrow pattern**: installation with narrow nailing, leaving the outermost columns free.

WHTPLATE540

INSTALLATION ON CLT

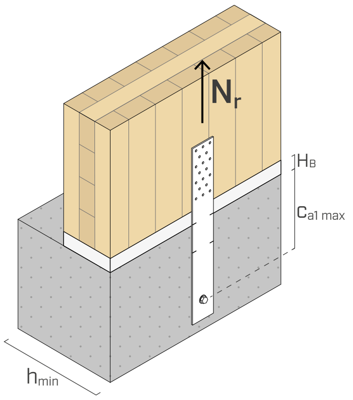


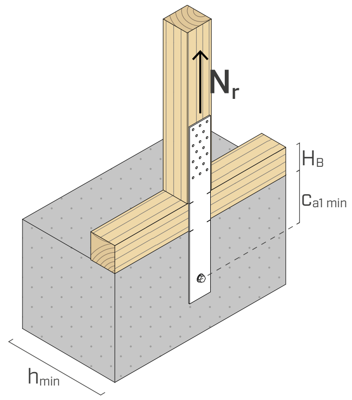
30 fasteners
partial fastening
LBA Ø4 x 60 | LBS Ø5 x 60



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 number of fastenings on timber. Alternative nailings are possible in accordance with the minimum distances for the connectors.





MINIMUM CONCRETE THICKNESS $h_{min} \geq 200$ mm

configuration	pattern	TIMBER fastening holes Ø5 Ø x L [mm]	TIMBER n_V [pcs]	TIMBER $H_{B\,max}$ [mm]	TIMBER-STEEL N_r (1)(2) Factored lateral resistance (K_D=1.15) G=0.35 [kN]	G=0.42 [kN]	G=0.49 [kN]	G=0.55 [kN]	CONCRETE uncracked VIN-FIX 5.8 Ø x L [mm]	uncracked [kN]	cracked VIN-FIX 5.8 Ø x L [mm]	cracked [kN]	seismic HYB-FIX 8.8 Ø x L [mm]	seismic [kN]
$c_{a1\,max}$ = 200 mm	wide pattern	LBA Ø4 x 60	18	20	**21,2**	**23,2**	**25,0**	**26,5**	M16 x 195	**29,6**	M16 x 195	**21,1**	M16 x 195	**21,1**
		LBS Ø5 x 60	18	30	**24,5**	**27,4**	**30,1**	**32,4**						
$c_{a1\,min}$ = 130 mm	wide pattern	LBA Ø4 x 60	15	90	**17,6**	**19,3**	**20,8**	**22,1**	M16 x 195	**19,0**	M16 x 195	**11,5**	M16 x 195	**12,9**
		LBS Ø5 x 60	13	95	**17,7**	**19,8**	**21,8**	**23,4**						
$c_{a1\,min}$ = 130 mm	narrow pattern	LBA Ø4 x 60	10	70	**11,8**	**12,9**	**13,9**	**14,7**	M16 x 195	**19,0**	M16 x 195	**11,5**	M16 x 195	**12,9**
		LBS Ø5 x 60	9	75	**12,2**	**13,7**	**15,1**	**16,2**						

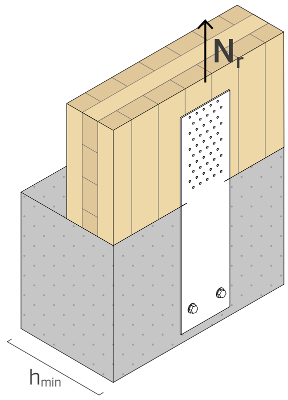
MINIMUM CONCRETE THICKNESS $h_{min} \geq 150$ mm

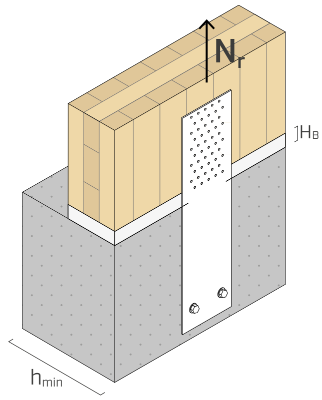
configuration	pattern	TIMBER fastening holes Ø5 Ø x L [mm]	TIMBER n_V [pcs]	TIMBER $H_{B\,max}$ [mm]	TIMBER-STEEL N_r (1)(2) Factored lateral resistance (K_D=1.15) G=0.35 [kN]	G=0.42 [kN]	G=0.49 [kN]	G=0.55 [kN]	CONCRETE uncracked VIN-FIX 5.8 Ø x L [mm]	uncracked [kN]	cracked VIN-FIX 5.8 Ø x L [mm]	cracked [kN]	seismic HYB-FIX 8.8 Ø x L [mm]	seismic [kN]
$c_{x\,max}$ = 200 mm	wide pattern	LBA Ø4 x 60	18	20	**21,2**	**23,2**	**25,0**	**26,5**	M16 x 130	**24,8**	M16 x 130	**17,7**	M16 x 130	**17,7**
		LBS Ø5 x 60	18	30	**24,5**	**27,4**	**30,1**	**32,4**						
$c_{x\,min}$ = 130 mm	wide pattern	LBA Ø4 x 60	15	90	**17,6**	**19,3**	**20,8**	**22,1**	M16 x 130	**16,1**	M16 x 130	**11,5**	M16 x 130	**11,5**
		LBS Ø5 x 60	13	95	**17,7**	**19,8**	**21,8**	**23,4**						
$c_{x\,min}$ = 130 mm	narrow pattern	LBA Ø4 x 60	10	70	**11,8**	**12,9**	**13,9**	**14,7**	M16 x 130	**16,1**	M16 x 130	**11,5**	M16 x 130	**11,5**
		LBS Ø5 x 60	9	75	**12,2**	**13,7**	**15,1**	**16,2**						

NOTES

- The concrete strength values are valid if the assembly notches of the WHTPLATE540 plate are positioned at the timber-to-concrete interface (c_{a1} = 260 mm).

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





MINIMUM CONCRETE THICKNESS $h_{min} \geq 200$ mm

		TIMBER			TIMBER-STEEL				CONCRETE					
configuration	pattern	fastening holes Ø5			N_r (1)(2) Factored lateral resistance (K_D=1.15)				uncracked		cracked		seismic	
		Ø x L	n_V	$H_{B\,max}$	G=0.35	G=0.42	G=0.49	G=0.55	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]	[kN]	[kN]	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
partial fastening 2 anchors M16	30 fasteners	LBA Ø4 x 60	30	-	**35,3**	**38,6**	**41,6**	**44,1**	M16 x 195	**42,4**	M16 x 195	**30,3**	M16 x 195	**30,3**
		LBS Ø5 x 60	30	10	**40,8**	**45,7**	**50,2**	**54,0**						
partial fastening 2 anchors M16	15 fasteners	LBA Ø4 x 60	15	60	**17,6**	**19,3**	**20,8**	**22,0**	M16 x 195	**42,4**	M16 x 195	**30,3**	M16 x 195	**30,3**
		LBS Ø5 x 60	15	70	**20,4**	**22,8**	**25,1**	**27,0**						

MINIMUM CONCRETE THICKNESS $h_{min} \geq 150$ mm

		TIMBER			TIMBER-STEEL				CONCRETE					
configuration	pattern	fastening holes Ø5			N_r (1)(2) Factored lateral resistance (K_D=1.15)				uncracked		cracked		seismic	
		Ø x L	n_V	$H_{B\,max}$	G=0.35	G=0.42	G=0.49	G=0.55	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]	[kN]	[kN]	[mm]	[kN]	[mm]	[kN]	[mm]	[kN]
partial fastening 2 anchors M16	30 fasteners	LBA Ø4 x 60	30	-	**35,3**	**38,6**	**41,6**	**44,1**	M16 x 130	**35,6**	M16 x 130	**25,4**	M16 x 130	**25,4**
		LBS Ø5 x 60	30	10	**40,8**	**45,7**	**50,2**	**54,0**						
partial fastening 2 anchors M16	15 fasteners	LBA Ø4 x 60	15	60	**17,6**	**19,3**	**20,8**	**22,0**	M16 x 130	**35,6**	M16 x 130	**25,4**	M16 x 130	**25,4**
		LBS Ø5 x 60	15	70	**20,4**	**22,8**	**25,1**	**27,0**						

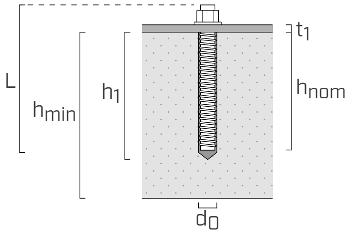
NOTES

- The concrete strength values are valid if the assembly notches of the WHTPLATE540 plate are positioned at the timber-to-concrete interface (c_{a1} = 260 mm).

ANCHORS INSTALLATION PARAMETERS

anchor type		t_1	$h_{nom} = h_{ef}$	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 www.rothoblaas.com.
MGS threaded rod class 8.8 to be cut to size: see page www.rothoblaas.com.



t_{fix}	thickness of plate
h_{nom}	nominal embedment depth
h_{eff}	effective anchor embedment depth
h_1	minimum hole depth
d_0	hole diameter in the concrete support
h_{min}	concrete minimum thickness

GENERAL PRINCIPLES

- The lateral resistance of LBS screws and LBA nails is determined according to CSA O86:2024, section 12.12 (self-tapping screws) and section 12.9 (nails and spikes), respectively.
- The steel plate, made of carbon steel S350, has a specified tensile strength of 330 MPa.
- The specified bending yield strength for LBA with a 4 mm diameter is f_{yb} = 645 MPa, and for LBS with a 5 mm diameter is f_{yb} = 1075 MPa.
- G is the mean relative density according to Table A.12 in CSA O86:2024. Typical wood species considered include Northern species (G = 0.35), Spruce-Pine-Fir (G = 0.42), Douglas Fir (G = 0.49), and Southern Pine (G = 0.55).
- Dimensioning and verification of the timber elements must be carried out separately.
- The calculation of the concrete anchors is performed following CSA A23.3:2024, Annex D.
- The anchor and anchor groups are designed for the maximum probable shear force that can be transmitted to the anchors by a non-yielding attachment (case b, Section D.4.3.6.3, CSA A23.3:2024).
- The characteristic bond stress of adhesive anchors in cracked and uncracked concrete is taken from European Technical Assessment test reports.
- Seismic design is carried out for a heavy seismic zone without ductility requirements for the anchors.
- The bond strength of HYB-FIX for seismic design is calculated by multiplying τ_{cr} by 0.8, according to Section D.6.5.2 in CSA A23.3:2024.
- The calculation process uses C25/30 concrete with a thin reinforcing layer and minimum thicknesses as indicated in the corresponding tables.
- It is assumed that there is no eccentricity in the applied load for the anchor groups and that the anchors are sufficiently distant from concrete edges parallel to the applied force.
- Fastening elements to concrete using anchors not listed in the table must be verified according to the load applied to the anchors.
- 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

NOTES

(1) Values for factored lateral resistance for self-taping screws are determined following the guidelines in Section 12.12 in CSA-O86 2024. Short term load duration factor (K_D = 1.15), dry service condition factor (K_{SF} = 1.0), and treatment factor (K_T = 1.0) are assumed.

(2) Adjustment factor for connections (J_x) is assumed to be equal to 0.9 for CLT connections.