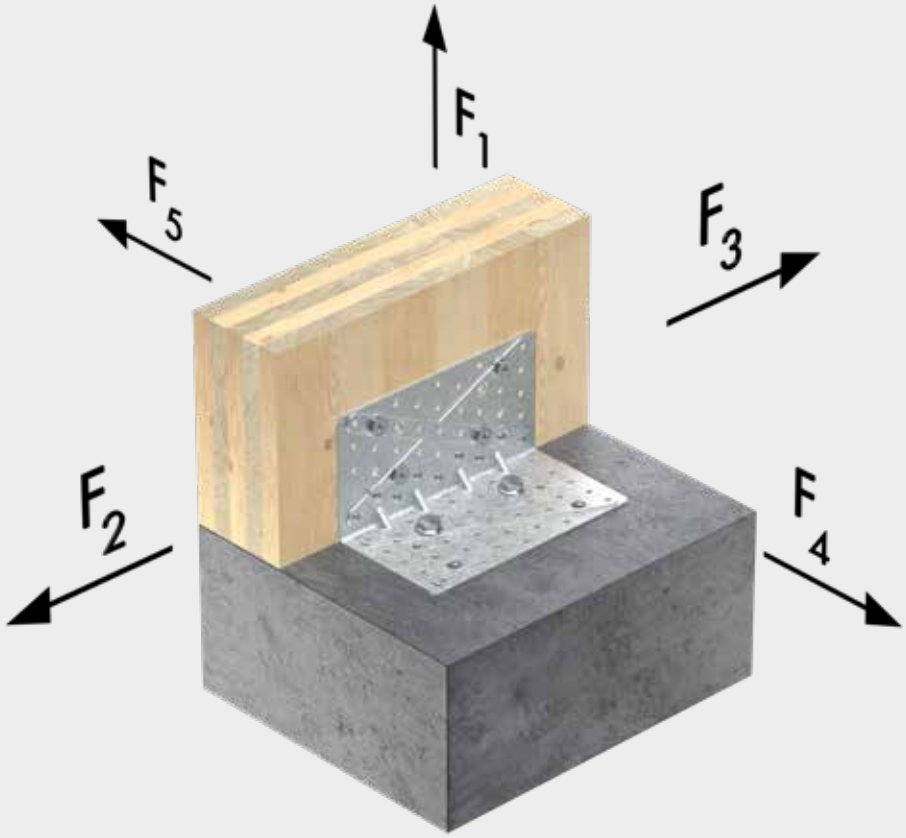
WÜRTH

CONNECTIONS CLT

Concrete foundation



CONTENTS

Please note:
Relevant parameters of ETA and/or other standards may be quoted in part and summarized in this brochure. Please observe the full text of the respective regulations and standards. Plausibility and conformity with currently applicable standards shall be checked and approved by the responsible structural engineer.

ASSY screws have approval in accordance with ETA-11/0190, are externally monitored and CE marked in accordance with Construction Products Regulation. For specific instructions for use please refer to ETA-11/0190.

1 Application

Fastening a wall element made from cross-laminated timber on a floor slab.

DENEB BRACKET FOR SHEAR AND TENSILE LOADS
Ideal for shear and tensile connections of timber structures to concrete or timber substructures.

The DENEB angle bracket features the following properties:

- High rigidity due to integrated stiffeners and beads
- High variability in the choice of fasteners
- Versatile options for fastening
- High load-bearing capacity
- Regulated in accordance with ETA-20/0773

S350GD carbon steel in accordance with DIN EN 10346:2015
Application in utilisation classes 1 and 2 (EN 1995-1-1)
Timber/timber and timber/concrete connections
Dimensions: 117 x 117 x 222 mm (W x H x L)

Fasteners and fastener patterns to be used for the DENEB bracket are specified in ETA-20/0773.

The regulation always describes the usage of the maximum possible number of fasteners, which can be screws or nails.

Please find an overview of the seven possible fastener patterns in timber on the next page.

The following dimensioning tables include standard edge and spacing distances and the required minimum anchoring depth for any fastener pattern.

Fastener patterns according to ETA-20/0773

Timber (specifications per leg)

	Dimensions [mm]	Fastener pattern in timber						
		1	2	3	4	5	6	7
ASSYplus VG 4 COMBI	12 x 160	4 screws				4 screws		
ASSYplus VG 4 CSMP	6 x 200		4 screws					
45° angled washer, round hole	6.5 x 2		4 washers					
ASSY 4 JH	5 x 50			35 screws		9 screws		
	5 x 70				35 screws			
Comb nail/anchor nail	4 x 60						35 nails	
Step nail	4 x 50							35 nails

Pattern 1

Pattern 2

Patterns 3, 4, 6, 7

Pattern 5

Concrete (specifications per leg)

Pattern 1

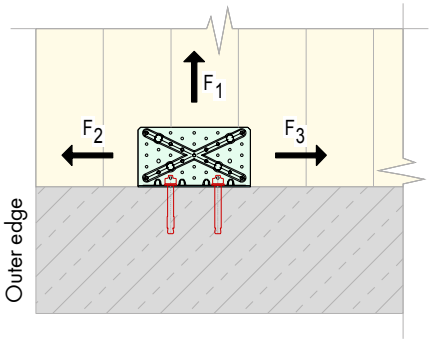
In concrete, **two fasteners** are used in the **inner holes** of the bracket.
This alternative provides for a higher load-bearing capacity compared to pattern 2.

Pattern 2

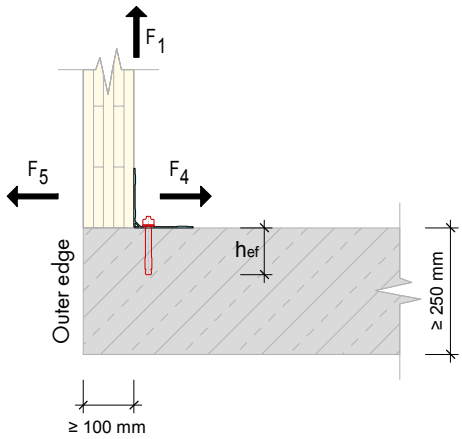
In concrete, **two fasteners** are used in the **outer holes** of the bracket. Inner holes may not be used due to the distances of the anchors to the outer edge of the floor slab, interfering reinforcement bars in the floor slab or other circumstances.

Installation situation and loads

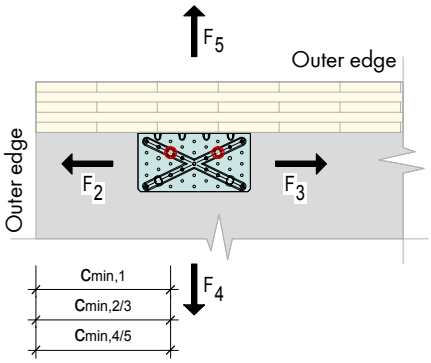
View 1



View 2



Top view



Key

$c_{min,1}$ minimum distance of fasteners in concrete for load F_1

$c_{min,2/3}$ minimum distance of fasteners in concrete for load F_2 and/or F_3

$c_{min,4/5}$ minimum distance of fasteners in concrete for load F_4 and/or F_5

Combined load between two timber and concrete components (TCC)

If loads F_1, $F_{2/3}$ or F_4 and/or F_5 act simultaneously, requirements of the respective ETA for usage of the specific fasteners in concrete must be met.

Installation instructions (concrete)

	h_{ef} [mm]	h_1 [mm]	d_0 [mm]	h_{min} [mm]	T_{inst} [mm]
Static					
Concrete screw W-BS/S 12x110	80	110	12	250	60
Fixing bolt anchor W-FAZ/S 12x125	70	90	12		45
Injection mortar Concrete Multi WIT-UH 300 + threaded rod 8.8 M12	100	120	14		40
Earthquake					
Injection mortar Concrete Multi WIT-UH 300 + threaded rod 8.8 M12	120	140	14	250	40

h_{ef} effective anchoring depth
h_1 minimum drilling depth
d_0 nominal bore diameter
h_{min} minimum height of concrete component
T_{inst} tightening torque

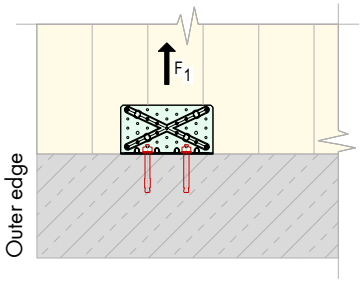
2 Design values for load-bearing capacity in accordance with DIN EN 1995-1-1/NA: 2013-08

Load-bearing capacity at load F_1

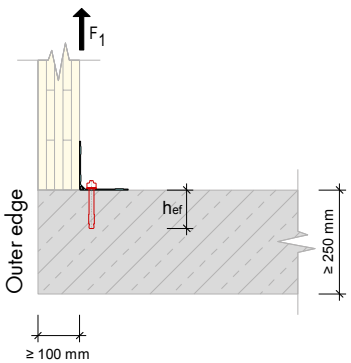
	Pattern on the timber part		h_{ef} [mm]	$F_{1,Rd}$ [kN] 1 to 7	$c_{min,1}$ [mm]
Pattern 1 on the floor slab	**Static**	W-BS/S	80	7.7	150
		W-FAZ/S	70	7.7	150
		WIT-UH 300 + threaded rod 8.8	100	7.7	150
	Earthquake	WIT-UH 300 + threaded rod 8.8	120	11.0	150
Pattern 2 on the floor slab	**Static**	W-BS/S	80	-	
		W-FAZ/S	70	-	
		WIT-UH 300 + threaded rod 8.8	100	-	
	Earthquake	WIT-UH 300 + threaded rod 8.8	120	-	

The design values for load-bearing capacity listed above refer to the **standard** load-bearing capacity calculated considering the connecting components timber, steel and concrete.
h_{ef}: Effective anchoring depth in mm
$F_{1,Rd}$: Design value for load-bearing capacity in kN
$c_{min,1}$: Minimum edge distance of fasteners in concrete in mm
To determine the design values for load-bearing capacity, partial safety factors and the modification factor (k_{mod}) in accordance with the following standards have been taken into account:
Timber parts: DIN EN 1995 and/or the respective National Annex for Germany (γ_M = 1.3; k_{mod} = 1.0),
Steel parts: DIN EN 1993 and/or the respective National Annex for Germany ($\gamma_{M,0}$ = 1.0; $\gamma_{M,1}$ = 1.1; $\gamma_{M,2}$ = 1.25),
Concrete parts: DIN EN 1992 and/or the respective National Annex for Germany (γ_M = 1.5).

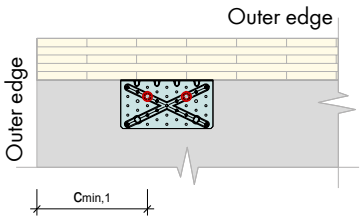
View 1



View 2



Top view

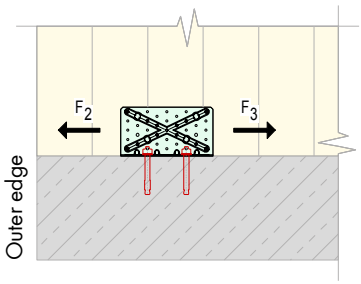


Load-bearing capacity at load $F_{2/3}$

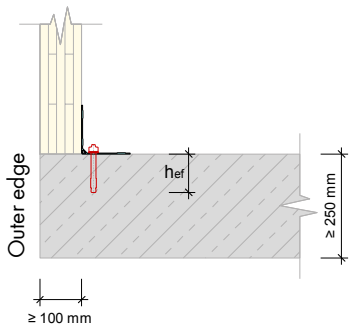
Pattern on the timber part			h_{ef} [mm]	$F_{2/3,Rd}$ ↔ [kN] 1	2	3	4	5	6	7	$c_{min,2/3}$ [mm]
Pattern 1 on the floor slab	**Static**	W-BS/S	80	15.4	7.5	27.7	32.3	26.2	20.8	18.5	450
		W-FAZ/S	70	15.4	7.5	27.7	32.3	26.2	20.8	18.5	750
		WIT-UH 300 + threaded rod 8.8	100	15.4	7.5	27.7	32.3	26.2	20.8	18.5	450
	Earthquake	WIT-UH 300 + threaded rod 8.8	120	22.0	10.8	22.8	22.8	22.8	22.8	22.8	300
Pattern 2 on the floor slab	**Static**	W-BS/S	80	13.1	7.2	20.8	26.2	21.5	12.3	10.0	450
		W-FAZ/S	70	13.1	7.2	20.8	26.2	21.5	12.3	10.0	750
		WIT-UH 300 + threaded rod 8.8	100	13.1	7.2	20.8	26.2	21.5	12.3	10.0	450
	Earthquake	WIT-UH 300 + threaded rod 8.8	120	18.7	10.3	22.8	22.8	22.8	17.6	14.3	300

The design values for load-bearing capacity listed above refer to the **standard** load-bearing capacity calculated considering the connecting components timber, steel and concrete.
h_{ef} Effective anchoring depth in mm
$F_{1,Rd}$: Design value for load-bearing capacity in kN
$c_{min,1}$: Minimum edge distance of fasteners in concrete in mm
To determine the design values for load-bearing capacity, partial safety factors and the modification factor (k_{mod}) in accordance with the following standards have been taken into account:
Timber parts: DIN EN 1995 and/or the respective National Annex for Germany (γ_M = 1.3; k_{mod} = 1.0),
Steel parts: DIN EN 1993 and/or the respective National Annex for Germany ($\gamma_{M,0}$ = 1.0; $\gamma_{M,1}$ = 1.1; $\gamma_{M,2}$ = 1.25),
Concrete parts: DIN EN 1992 and/or the respective National Annex for Germany (γ_M = 1.5).

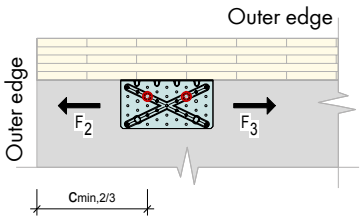
View 1



View 2



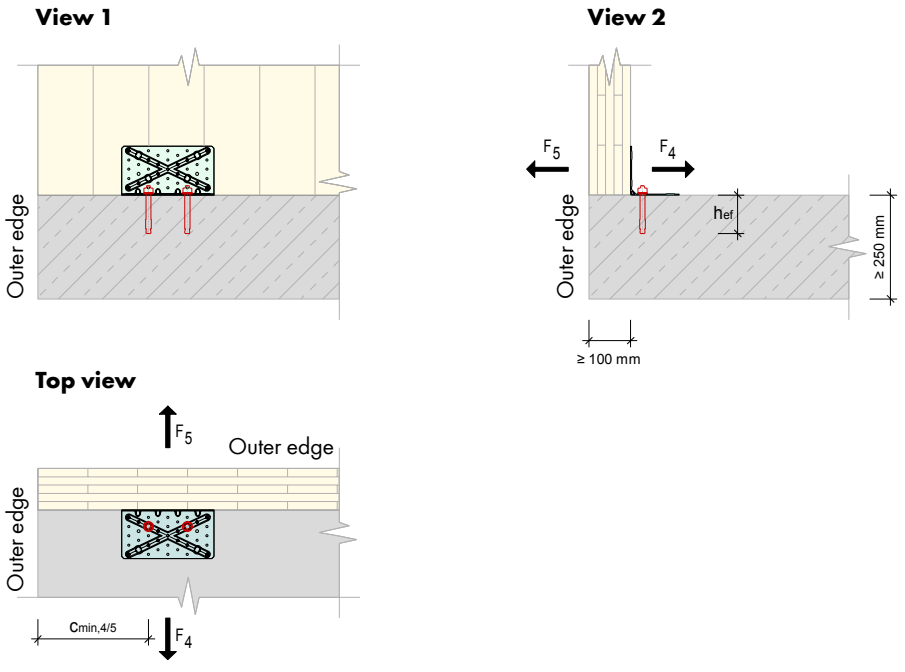
Top view



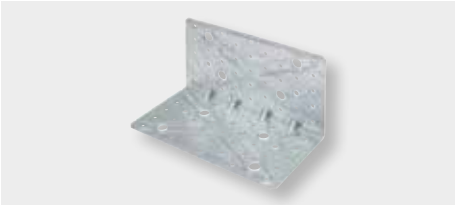
Load-bearing capacity at load $F_{4/5}$

	Pattern on the timber part		h_{ef} [mm]	$F_{4,Rd}$ → [kN] 1 to 7	$F_{5,Rd}$ ← [kN] 1	2	3	4	5	6	7	$c_{min,4/5}$ [mm]
Pattern 1 on the floor slab	Static	W-BS/S	80	23.8	7.7	7.7	18.5	25.3	21.5	10.0	9.2	300
		W-FAZ/S	70	23.8	7.7	7.7	17.7	17.7	17.7	10.0	9.2	300
		WIT-UH 300 + threaded rod 8.8	100	23.8	7.7	7.7	18.5	26.2	21.5	10.0	9.2	300
	Earth-quake	WIT-UH 300 + threaded rod 8.8	120	22.8	11.0	11.0	22.8	22.8	22.8	14.3	13.2	300
Pattern 2 on the floor slab	Static	W-BS/S	80	23.8	7.7	7.7	18.5	25.3	21.5	10.0	9.2	300
		W-FAZ/S	70	23.8	7.7	7.7	17.7	17.7	17.7	10.0	9.2	300
		WIT-UH 300 + threaded rod 8.8	100	23.8	7.7	7.7	18.5	26.2	21.5	10.0	9.2	300
	Earth-quake	WIT-UH 300 + threaded rod 8.8	120	22.8	11.0	11.0	22.8	22.8	22.8	14.3	13.2	300

The design values for load-bearing capacity listed above refer to the **standard** load-bearing capacity calculated considering the connecting components timber, steel and concrete.
h_{ef}: Effective anchoring depth in mm
$F_{i,Rd}$: Design value for load-bearing capacity in kN
$c_{min,i}$: Minimum edge distance of fasteners in concrete in mm
To determine the design values for load-bearing capacity, partial safety factors and the modification factor (k_{mod}) in accordance with the following standards have been taken into account:
Timber parts: DIN EN 1995 and/or the respective National Annex for Germany (γ_M = 1.3; k_{mod} = 1.0),
Steel parts: DIN EN 1993 and/or the respective National Annex for Germany ($\gamma_{M,0}$ = 1.0; $\gamma_{M,1}$ = 1.1; $\gamma_{M,2}$ = 1.25),
Concrete parts: DIN EN 1992 and/or the respective National Annex for Germany (γ_M = 1.5).



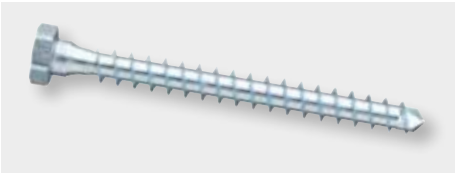
3 Products



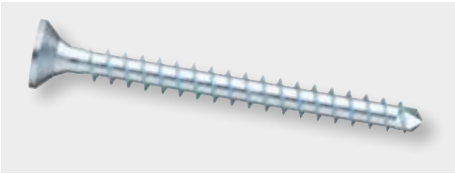
Deneb angle bracket
The Deneb bracket for shear and tensile loads is ideal for connecting timber structures to concrete or timber substructures
Art. no. 5390 000 300

45° angled washer, round hole
Custom-fit washer with 45° drilling channel for optimum transfer of tensile loads for metal/wood connections
Art. no. 0457 700 ...

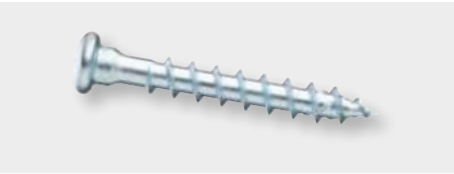
Comb nail/anchor nail
Zinc-plated steel, blue passivated (A2K)
Art. no. 0681 94 ...



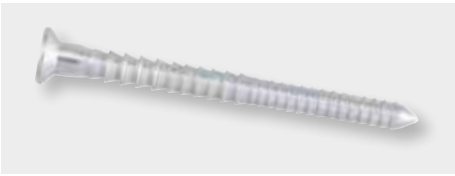
ASSYplus VG 4 COMBI
Special full-thread screw with hexagon head and underside shank reinforcement for high-load-bearing metal/wood connections in structural wood construction, which also require small edge and screw clearances, in indoor dry or wet areas
Art. no. 0150 2 ...



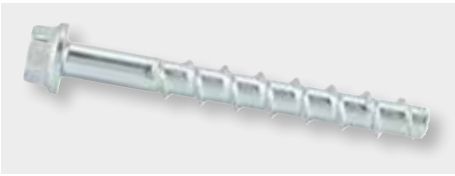
ASSYplus VG 4 CH
Special full-thread screw with countersunk head with milling pockets for universal use for high-load-bearing wood/wood, wood/metal connections or reinforcements in structural wood construction, which also require small edge and screw clearances, in indoor dry or wet areas
Art. no. 0150 1 ...



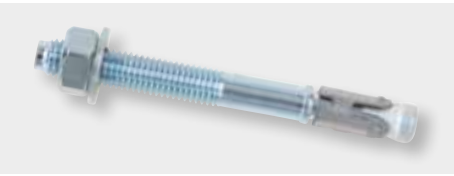
ASSY 4 JH
Full-thread screw with visually appealing pan head with underhead shank reinforcement for fastening sheet metal parts and metal connectors in wood in indoor dry or wet areas without play
Art. no. 0153 3 ...



Step nail
Optimized nail for fastening wood connectors in BauBuche, hardwood and softwood
Art. no. 0681 945 040

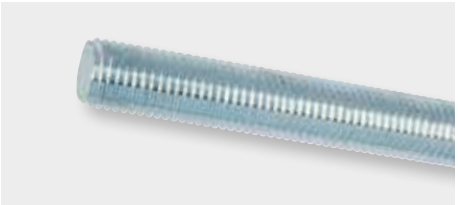


Concrete screw W-BS/S
Highest load capacities and efficient mounting. Ideal for connecting metal structures to concrete. Zinc-plated steel. Connection can be adjusted twice after installation
Art. no. 5929 12 ...



Fixing bolt anchor W-FAZ/S
Bolt anchor for high loads in cracked and non-cracked concrete.
Art. no. 5928 2 ...
5928 212 030
0904 5 ...

Chemical injection mortar Concrete Multi WIT-UH 300
High-performance mortar for concrete and post-installed rebar connections
Art. no. 5918 5 ...



Threaded rod M12
DIN 976 zinc-plated steel 8.8, shape A
Art. no. 0959 012

4 Application-related product selection

Cordless hammer drill
ABH 18 COMPACT M-CUBE®
Art. no. 5701 403 ...

Hammer drill bit box
Plus Quadro-L Vario
Art. no. 0648 050 001

Cordless drill screwdriver
ABS 18 Power M-CUBE®
Art. no. 5701 404 ...

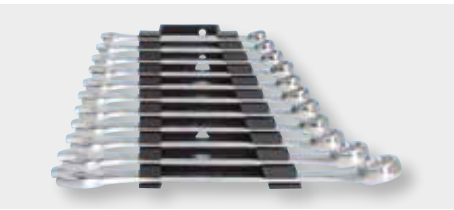
1/4 inch bit box
Art. no. 0614 250 102

Auger drill bit Plus
Art.-no. 0650 68 ... / 0650 61 ...

Roofer's hammer
Art. no. 0714 733 030

Angle grinder
AWS 18-125 P COMPACT M-CUBE®
Art. no. 5701 402 ...

Cutting disc Speed
Art. no. 0664 10 ...



Combination wrench
Art. No. 0713 301 4 ...

1/2-inch torque wrench
Art.-no. 0714 71 23

Mechanic's glove
Art. no. 0624 400 528

Safety goggles Electra
Art. no. 0899 102 340

Corded ear plugs
Art. no. 0899 300 338

Safety shoes S3 SRC Stretch X grey
M418 099 ...

5 General conditions

Installation conditions

Wall element made from	Cross-laminated timber CLT element (t = 10 cm) Outer edge of CLT wall is flush with the floor slab
Concrete floor slab	C25/30 concrete Cracked concrete Reinforcement against cracking Allowed annular gap exists No spaced installation Regular surface reinforcement Edge reinforcement with d ≥ 12 mm and a ≤ 100 mm

Calculation basis

DIN EN 1995-1-1:2010-12	Design of timber structures – Common rules and rules for timber buildings
DIN EN 1995-1-1/NA:2013-08	National Annex - Nationally determined parameters
DIN 20000-6	Application of construction products in structures - Part 6: Dowel-type fasteners and connectors
ETA-11/0190	Self-tapping screws for use in timber constructions
ETA-20/0773	DENEB angle bracket
ETA-17/0127	Injection mortar MULTI WIT-UH 300 CONCRETE
ETA-16/0043	Concrete screw with hexagon head W-BS/S

Earthquake

ETAG001	Annex E: Assessment of Metal Anchors under Seismic Action
EOTA TR045	Design of Metal Anchors For Use In Concrete Under Seismic Actions
Importance class:	II in accordance with EC8 4.2.5
Performance category:	C2 in accordance with TR045
Design options:	a2) in accordance with TR045 An annular gap should be avoided in seismic design situations a_{Gap} = 1.0 without annular gap (a_{Gap} = 0.5 with allowed annular gap in accordance with TR045)

CONNECTIONS CLT

Concrete foundation

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