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Design example, Post support joint D aBv 19613201

Post, joint

Post NH C24 14/14

Planned distance of the end-grain end from the floor: $a \approx 200 \text{ mm}$

Service class 2 (Post under roof and protected from the weather, water spray)

Combinations of actions

- 1 Combination of self-weight and snow, k_{mod} = 0.9
 - Compressive force F_{1,c,Ed} = 31.2 kN
- 2 Combination of self-weight and wind, $k_{mod} = 1.0$

Tensile force $F_{1,t,Ed}$ = 2.47 kN Horizontal force $F_{2/3}$ and $F_{4/5}$ = 0.78 kN

If correct arrangement of the post support is not checked in the place of installation, the horizontal load should be assumed to be n the most unfavourable constellation.

Properties and requirements of the post support from table

Column base			Post		Maximum spacings			
Туре	Art No	Fasteners	min w	min h	max a	e _{2/3}	e _{4/5}	
	Art.No.		mm	mm	mm	mm	mm	
D aBv	19613201	4 screws Ø10x120	120	120	236	236	236	

Specified fasteners

• 4 screws \varnothing 10x120 to EN 14592 with thread length I_{ef} \ge 100 mm

 \rightarrow e.g. GH timber screw HS+ $\varnothing10x200$ with I_{ef} = 100 mm

or hex head wood screws to DIN 571 \varnothing 10x180 with I_{ef} = 0.6 \cdot 180 = 108 mm

The screws are to be screwed into predrilled holes.

Specified minimum cross-section of the post

b/h =14/14 > min b/h = 12/12 ✓

Maximum spacings

a = 200 mm < max a = 236 mm 🗸

Load-carrying capacities of the post support from the table and strength verifications

Columne base		F _{1,c} - compression		F _{1,t} - tension		F _{2/3}			F _{4/5}				
Туре	Art.No.	Timber	Stee	I	Timber	St	eel	Timber	Ste	eel	Timber	Ste	eel
		F1,c,Rk,Holz	F1,c,Rk,Stahl	γ _{M,Stahl}	F _{1,t,Rk,Holz}	F1,t,Rk,Stahl	γ _{M,Stahl}	F _{2/3,Rk,Holz}	F _{2/3,Rk,Stahl}	γ _{M,Stahl}	F4/5, Rk, Holz	F4/5, Rk, Stahl	γ _{M,Stahl}
D aBv	19613201 ^{b)}	129	59,2 ¹⁾ 44,3	1,00 1,10	16,3 ^{d)}	6,66	1,00	8,365)	1,66	1,25	8,365)	1,66	1,25



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Design value of the load-carrying capacities for action combination 1

^{b)} The thickness of the baseplate is 6 mm \rightarrow the reduction factors ¹⁾ and ⁵⁾ are to be taken into consideration!

 $\begin{aligned} F_{1,c,Rd} &= \min \left\{ k_{mod} \cdot F_{1,c,Rk,timber} \, / \, \gamma_{M,timber} \, ; \, F_{1,c,Rk,steel} \, / \, \gamma_{M,Stahl} \right\} = \min \left\{ 0.9 \cdot 129 \, / \, 1.3 \, ; \, 0.67 \cdot 59.2 \, / \, 1.0 \, ; \, 44.3 \, / \, 1.1 \right\} \\ &= 39.7 \; kN \end{aligned}$

Verification of the load-carrying capacity for action combination 1

 $F_{1,c,Ed} / F_{1,c,Rd} = 31.2 / 39.7 = 0.79 \checkmark$

Design value of the load-carrying capacities for action combination 2

^{d)} An increase in resistance (load-carrying capacity) of the timber joint does not affect the overall resistance here, as the overall resistance is limited by the steel's resistance.

 $F_{1,t,Rd} = min \{k_{mod} \cdot F_{1,t,Rk,Timber} / \gamma_{M,Timber}; F_{1,t,Rk,Steel} / \gamma_{M,steel}\} = min \{1.0 \cdot 16.3 / 1.3; 6.66 / 1.0\} = 6.66 \text{ kN}$

 $\begin{aligned} \mathsf{F}_{2/3,\text{Rd}} &= \mathsf{F}_{4/5,\text{Rd}} = \min \left\{ \mathsf{k}_{\text{mod}} \cdot \mathsf{F}_{2/3,\text{Rk},\,\text{timber}} \,/\, \gamma_{\text{M},\text{timber}} \,;\, \mathsf{F}_{2/3,\text{Rk},\text{steel}} \,/\, \gamma_{\text{M},\text{steel}} \right\} &= \min \left\{ 1.0 \cdot 0.84 \cdot 8.36 \,/\, 1.3 \,;\, 1.66 \,/\, 1.25 \right\} \\ &= 1.33 \; \text{kN} \end{aligned}$

Verification of the load-carrying capacity for action combination 2

 $F_{1,t,Ed} / F_{1,t,Rd} + F_{2/3,Ed} / F_{2/3,Rd} = 2.47 / 6.66 + 0.78 / 1.33 = 0.96 \checkmark$

Loading of the anchor bolts

4 anchor bolts \varnothing 12 mm

Action combination 1

No loading of the anchor bolts, as the compressive force is transferred through the footplate and into the substrate.

Action combination 2

If correct arrangement of the post support is not checked in the place of installation, the load of the anchor bolt should be determined using the most unfavourable constellation. Further, it is recommended that the anchor bolt load then be determined with the maximum spacing $e_{2/3}$ or $e_{4/5}$.

• Tensile load on the anchor bolts due to load F_{1,t,Ed} and eccentric load F_{4/5,Ed}

 $F_{ax,Bo,Ed} = F_{1,t,Ed} / 4 + F_{4/5,Ed} / 2 \cdot e_{4/5} / 70 \text{ mm} = 2.47 / 4 + 0.78 / 2 \cdot 236 / 70 = 1.93 \text{ kN}$

(The distance between the rotation point and the member edge was assumed to be 10 mm.)

 \bullet Lateral load of the anchor bolt due to load $F_{4/5,\text{Ed}}$

 $F_{lat,Bo,Ed} = F_{4/5,Ed} / 4 = 0.78 / 4 = 0.20 \text{ kN}$



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a; e_{2/3}; e_{4/5}





Design example, Post support joint D aBv 19823130

Post, joint

Post NH C24 14/14

Planned distance of the end-grain end from the floor: $a \approx 200 \text{ mm}$ Service class 3 (weathering of the post possible)

Combinations of actions

- 1 Combination of self-weight and snow, $k_{mod} = 0.7$ Compressive force $F_{1,c,Ed} = 43.2$ kN
- 2 Combination of self-weight and wind, $k_{mod} = 0.8$

Tensile force $F_{1,t,Ed} = 1.18 \text{ kN}$ Horizontal force $F_{2/3}$ and $F_{4/5} = 0.98 \text{ kN}$

Free $F_{2/3}$ and $F_{4/5} = 0.98$ kN

If correct arrangement of the post support is not checked in the place of installation, the horizontal load should be assumed to be n the most unfavourable constellation.

Properties and requirements of the post support from table

Colu	mn base		Post	t	Maximum spacings			
Type	Art No	Fasteners	min w	min h	max a	e _{2/3}	e 4/5	
Type	Art.110.		mm	mm	mm	mm	mm	
D aBv	19823130	4 screws \varnothing 10x120 (Load case F _{1,t} :+1 dowel \varnothing 10)	120	120	210	210	210	

Specified fasteners

 \bullet 4 screws Ø10x120 to EN 14592 with thread length $I_{ef} \geq 100 \text{ mm}$

Hot-dip galvanised hex head wood screws to DIN 571 \oslash 10x180 with I_{ef} = 0.6 \cdot 180 = 108 mm

 $\bullet\,1$ dowel Ø10x140 S235 hot-dip galvanised for loading by load $F_{1,t}$

Hot-dip galvanised fasteners are required due to service class 3.

The screws are to be screwed into predrilled holes.

Specified minimum cross-section of the post

b/h =14/14 > min b/h = 12/12 ✓

Maximum spacings

a = 200 mm < max a = 210 mm ✓

Load-carrying capacities of the post support from the table and strength verifications

Column base		F _{1,c} - compression			F _{1,t} - tension			F _{2/3}			F _{4/5}			
Туре	ArtNo.	Art No Timbe		Ste	Steel Timber		Ste	el Timber		Steel		Timber	Steel	
		F _{1,c,Rk,Holz}	F _{1,c,Rk,Stahl}	YM,Stahl	F1,t,Rk,Holz	F _{1,t,Rk,Stahl}	γM,Stahl	F _{2/3,Rk,Holz}	F _{2/3,Rk,Stahl}	γ _{M,Stahl}	F4/5, Rk, Holz	F _{4/5,Rk,Stahl}	γ _{M,Stahl}	
D aBv	19823130 ^{b)}	129	95,5	1,25	6,36 ^{c)}	6,66 ^{c)}	1,00	7,675)	2,01	1,00	7,675)	1,55	1,00	



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Design value of the load-carrying capacities for action combination 1

^{b)} The thickness of the baseplate is 6 mm \rightarrow the reduction factor ⁵⁾ must be taken into consideration!

 $F_{1,c,Rd} = min \{k_{mod} \cdot F_{1,c,Rk,timber} / \gamma_{M,timber}; F_{1,c,Rk,steel} / \gamma_{M,steel}\} = min \{0.7 \cdot 129 / 1.3; 95.5 / 1.25\} = 69.5 \text{ kN}$

Verification of the load-carrying capacity for action combination 1

 $F_{1,c,Ed} / F_{1,c,Rd} = 43.2 / 69.5 = 0.62 \checkmark$

Design value of the load-carrying capacities for action combination 2

 $F_{1,t,Rd} = min \{k_{mod} \cdot F_{1,t,Rk, timber} / \gamma_{M,timber}; F_{1,t,Rk,steel} / \gamma_{M,steel}\} = min \{0.8 \cdot 6.36 / 1.3; 6.66 / 1.0\} = 3.91 \text{ kN}$

 $F_{2/3,Rd} = F_{4/5,Rd} = min \{k_{mod} \cdot F_{2/3,Rk, timber} / \gamma_{M,timber}; F_{2/3,Rk,steel} / \gamma_{M,steel}\} = min \{0.8 \cdot 0.84 \cdot 7.67 / 1.3; 1.55 / 1.0\}$ = 1.55 kN

The more unfavourable of the two load cases $F_{2/3}$ and $F_{4/5}$ is used for the resistance analysis.

Verification of the load-carrying capacity for action combination 2

 $F_{1,t,Ed} / F_{1,t,Rd} + F_{2/3,Ed} / F_{2/3,Rd} = 1.18 / 3.91 + 0.98 / 1.55 = 0.93 \checkmark$

Loading of the anchor bolts

4 anchor bolts Ø12 mm

Action combination 1

No loading of the anchor bolts, as the compressive force is transferred through the footplate and into the substrate.

Action combination 2

If correct arrangement of the post support is not checked in the place of installation, the load of the anchor bolt should be determined using the most unfavourable constellation. Further, it is recommended that the anchor bolt load then be determined with the maximum spacing $e_{2/3}$ or $e_{4/5}$.

• Tensile load on the anchor bolts due to load F_{1,t,Ed} and eccentric load F_{4/5,Ed}

 $F_{ax,Bo,Ed} = F_{1,t,Ed} / 4 + F_{4/5,Ed} / 2 \cdot e_{4/5} / 70 \text{ mm} = 1.18 / 4 + 0.98 / 2 \cdot 210 / 70 = 1.77 \text{ kN}$

(The distance between the rotation point and the member edge was assumed to be 10 mm.)

• Lateral load of the anchor bolt due to load F_{4/5,Ed}

 $F_{lat,Bo,Ed} = F_{4/5,Ed} / 4 = 0.98 / 4 = 0.25 \text{ kN}$



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