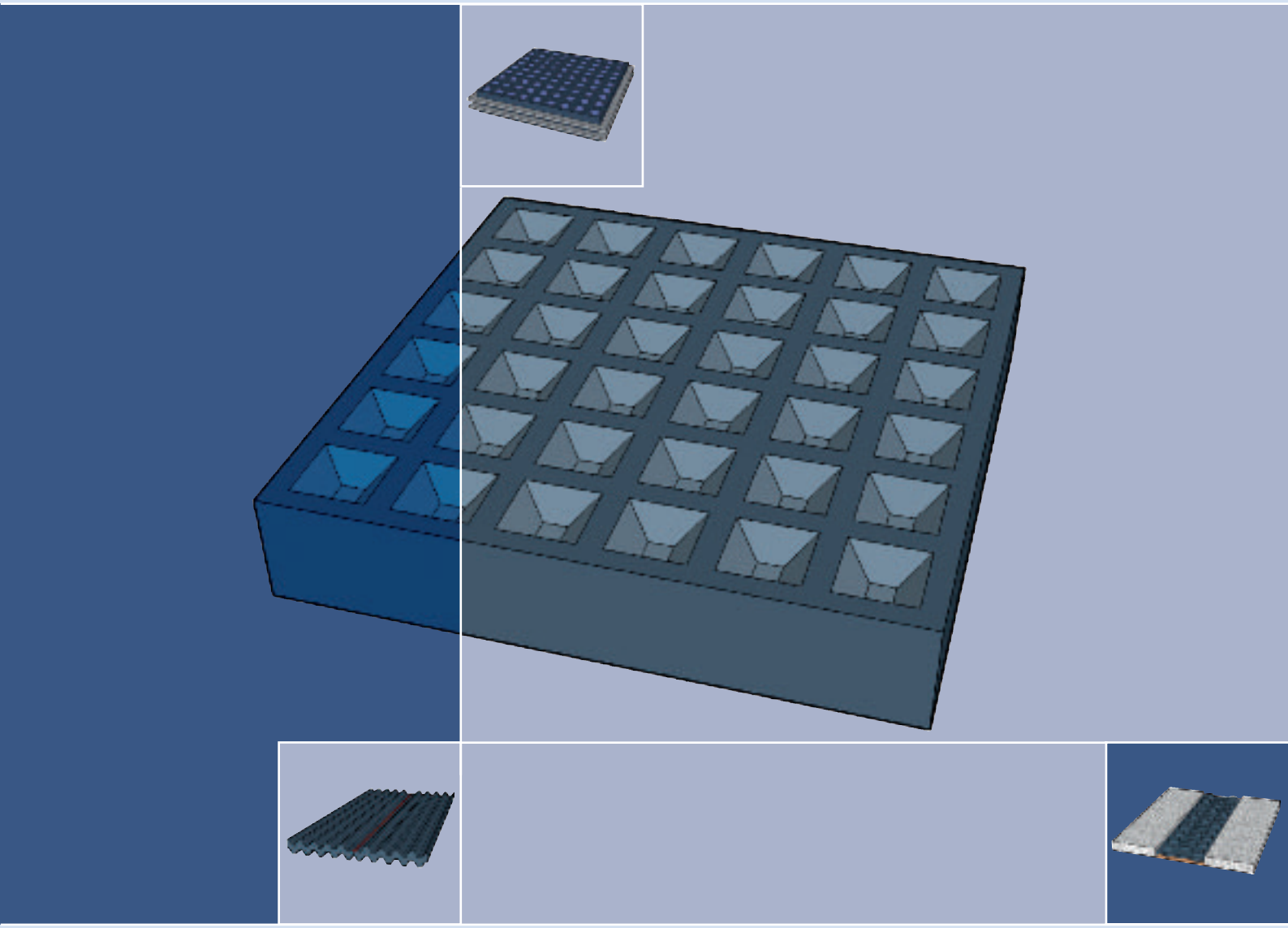
CALENBERG INGENIEURE

Standard Elastomeric Bearings

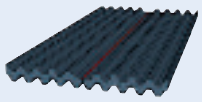
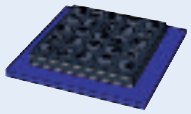
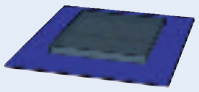
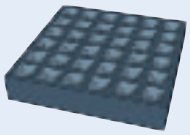


Elastic support of structural members subject to static loading

Scope and dimensioning guidelines

planmäßig elastisch lagern

Standard Elastomeric Bearings

Bearing type	Bearing thickness [mm]	Permissible compressive stress $\sigma_{m,k}$** [N/mm²]	Product description	
bi-Trapez Bearing®	5 10 15 20	**15** **10** **7** **5**	Unreinforced elastomeric bearing, shape independent loadability, quality controlled material; Official Certificate No. P-849.0554/1	
Cigular® Bearing	10	**1,1**	Low shear resistant deforming bearing, thermally insulated, for supporting reinforced concrete floor slab on load bearing structures; Official Certificate No. P-20040369	
Ciparall® Sliding Bearing	11 14 20 30 40	**15***	Reinforced elastomeric sliding bearing with separated sliding and deforming layer (stable sliding area); Official Certificate No. P-852.0290-4	
Civalit® Sliding Bearing	11	**15**	Transverse tensile reinforced strip sliding bearing (stable sliding area); Official Certificate No. P-20041090	
Compact Bearing CR 2000	11 16 21	**20***	Unreinforced elastomeric bearing; Official Certificate No. 850.0425; Official Approval No. Z-16.32-435	

* *permissible compressive stress as f (shape factor)*
** *characteristic design values*

CALENBERG
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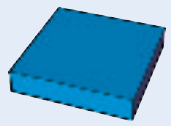
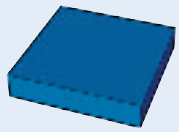
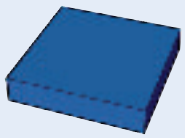
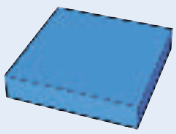
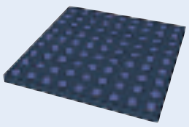
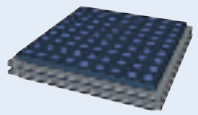
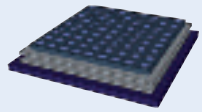
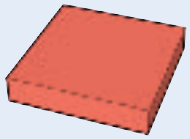
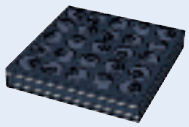
Bearing type	Bearing thickness [mm]	Permissible compressive stress $\sigma_{m,k}$** [N/mm²]	Product description	
Compact Bearing G	5 10 15 20	**5***	Unreinforced elastomeric bearing; Official Approval No. Z-16.32-426	
Compact Bearing S 70	5 8 10 15 20	**15***	Unreinforced elastomeric bearing; Official Certificate No. 850.0427	
Compact Bearing S 65	5 8 10 15 20 25 30	**10***	Unreinforced elastomeric bearing; Official Certificate No. 851.0364	
Compression Bearing	5 10 15 20	**5***	Unreinforced elastomeric bearing; Official Certificate No. P-852.0290-6	
Perforated™ Bearing 205	5 8	**25***	Perforated unreinforced elastomeric bearing; Official Certificate No. P-852.0290-1	

* *permissible compressive stress as f (shape factor)*
** *characteristic design values*

Standard Elastomeric Bearings

Standard Elastomeric Bearings

Bearing type	Bearing thickness [mm]	Permissible compressive stress $\sigma_{m,k}$** [N/mm²]	Product description	
Perforated™ Bearing Steel Reinforced	14 20 22 30 31 38 42 53	**25***	Steel reinforced elastomeric bearing; Official Certificate No. P-852.0290-1	
Perforated™ Sliding Bearing	14 17 22 28 30 38 39 50	**25***	Steel reinforced elastomeric sliding bearing with separated sliding and deforming layer (stable sliding area); Official Certificate No. P-852.0290-1	
Compact Core Bearing	5 10 15 20	**30***	Elastomeric bearing of high hardness with small deflection, suitable to provide thermal insulation in steel constructions; Official Certificate No. P-852.0448	
Sandwich Bearing Q	10 20 30 40	**15***	Steel reinforced elastomeric bearing; Official Certificate No. P-852.0290-3	

* *permissible compressive stress as f (shape factor)*
** *characteristic design values*

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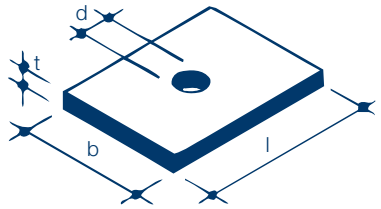
Since 1964 Calenberg Elastomeric bearings have been employed where compressive forces, angular rotations and horizontal forces affect structural element junctions and can damage the construction. Elastomeric bearings are virtually incompressible, i. e. even under load they hold a constant volume. When a vertical load is applied to an elastomeric bearing, it deflects and bulges laterally. This behaviour can be reduced by inserting steel plates.
Increasing environmental impact requires higher ageing resistance of the construction materials.

All of Calenberg's elastomeric bearings have been certificated to meet the standards regarding resistance to weathering, ozone and UV.

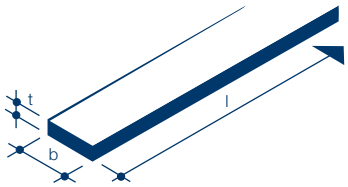
For the dimensioning of unreinforced elastomeric bearings the shape factor S – ratio of loaded area to unloaded laterally bulging area – has proven to be useful (see equations below).

The auxiliary values in the table on page 6 allow users to quickly determine the shape factor. The values are a function of the bearing's physical dimensions (length and width). The value determined is then divided by the required bearing thickness. The shape factor S obtained is used as an input parameter for the graph on page 7, which shows unreinforced Calenberg elastomeric bearings for preselection purpose. The other required input parameter is the existing compressive stress. The required type of bearing can then be read off the graph; it is indicated by the line above the intersection point of the two entered values.

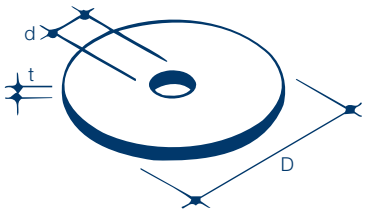


without hole: $S = \frac{l \cdot b}{2 \cdot t\,(l + b)}$

with hole: $S = \frac{4 \cdot l \cdot b - \pi \cdot d^2}{4 \cdot t\,(2 \cdot l + 2 \cdot b + \pi \cdot d)}$



$S \approx \frac{b}{2 \cdot t}$



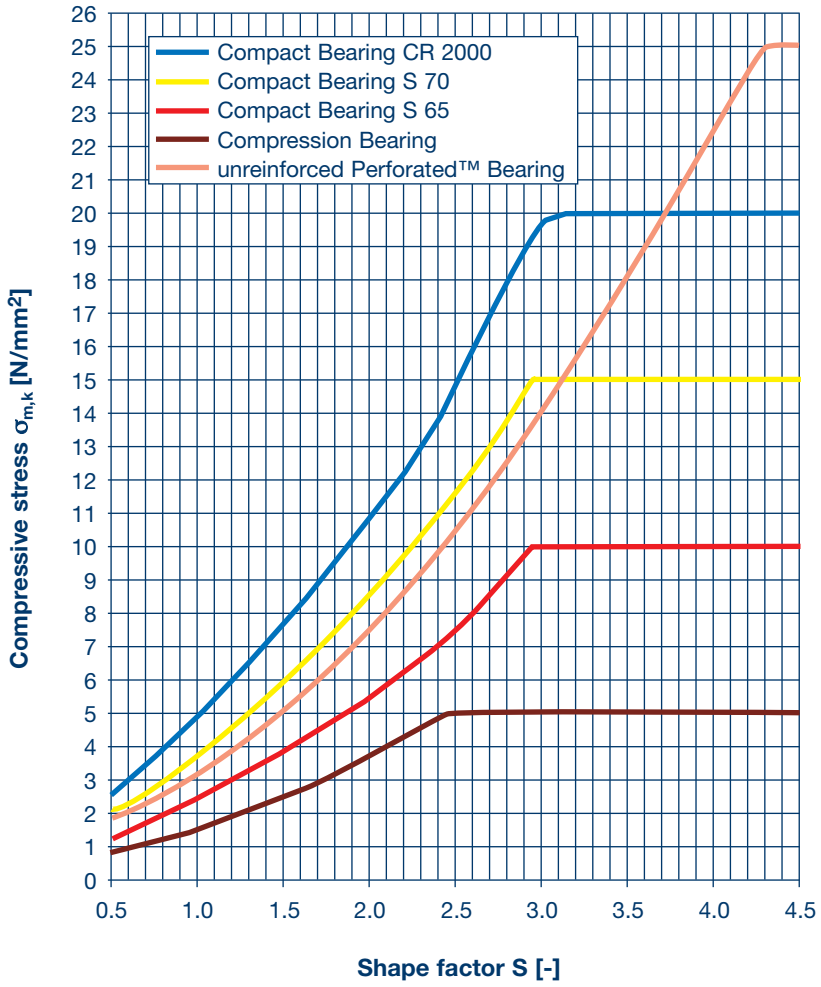
without hole: $S = \frac{D}{4 \cdot t}$

with hole: $S = \frac{D - d}{4 \cdot t}$

Dimensioning of Elastomeric Bearings

Auxiliary Values for Shape Factors

Bearing width [mm]	Bearing length [mm]																													
	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400
100	25	26	27	28	29	30	31	31	32	33	33	34	34	35	35	36	36	36	37	37	38	38	38	38	39	39	39	39	40	40	40
110	26	28	29	30	31	32	33	33	34	35	35	36	37	37	38	38	39	39	39	40	40	41	41	41	42	42	42	42	43	43	43
120	27	29	30	31	32	33	34	35	36	37	38	38	39	39	40	41	41	42	42	42	43	43	44	44	44	45	45	45	46	46	46
130	28	30	31	33	34	35	36	37	38	39	39	40	41	42	42	43	43	44	44	45	45	46	46	47	47	47	48	48	48	49	49
140	29	31	32	34	35	36	37	38	39	40	41	42	43	44	44	45	46	46	47	47	48	48	49	49	50	50	50	51	51	52	52
150	30	32	33	35	36	38	39	40	41	42	43	44	45	45	46	47	48	48	49	49	50	51	51	52	52	53	53	53	54	54	55
160	31	33	34	36	37	39	40	41	42	43	44	45	46	47	48	49	50	50	51	52	52	53	53	54	54	55	55	56	56	57	57
170	31	33	35	37	38	40	41	43	44	45	46	47	48	49	50	51	51	52	53	54	54	55	56	56	57	57	58	58	59	59	60
180	32	34	36	38	39	41	42	44	45	46	47	48	50	50	51	52	53	54	55	56	56	57	58	58	59	59	60	61	61	62	62
190	33	35	37	39	40	42	43	45	46	48	49	50	51	52	53	54	55	56	57	57	58	59	60	60	61	62	62	63	63	64	64
200	33	35	38	39	41	43	44	46	47	49	50	51	52	53	55	56	57	57	58	59	60	61	62	62	63	64	64	65	66	66	67
210	34	36	38	40	42	44	45	47	48	50	51	53	54	55	56	57	58	59	60	61	62	63	63	64	65	66	66	67	68	68	69
220	34	37	39	41	43	45	46	48	50	51	52	54	55	56	57	59	60	61	62	63	63	64	65	66	67	68	68	69	70	70	71
230	35	37	39	42	44	45	47	49	50	52	53	55	56	58	59	60	61	62	63	64	65	66	67	68	69	69	70	71	72	72	73
240	35	38	40	42	44	46	48	50	51	53	55	56	57	59	60	61	62	64	65	66	67	68	69	69	70	71	72	73	74	74	75
250	36	38	41	43	45	47	49	51	52	54	56	57	59	60	61	63	64	65	66	67	68	69	70	71	72	73	74	75	75	76	77
260	36	39	41	43	46	48	50	51	53	55	57	58	60	61	62	64	65	66	67	69	70	71	72	73	74	75	75	76	77	78	79
270	36	39	42	44	46	48	50	52	54	56	57	59	61	62	64	65	66	68	69	70	71	72	73	74	75	76	77	78	79	80	81
280	37	39	42	44	47	49	51	53	55	57	58	60	62	63	65	66	67	69	70	71	72	74	75	76	77	78	79	80	81	81	82
290	37	40	42	45	47	49	52	54	56	57	59	61	63	64	66	67	69	70	71	73	74	75	76	77	78	79	80	81	82	83	84
300	38	40	43	45	48	50	52	54	56	58	60	62	63	65	67	68	70	71	72	74	75	76	77	79	80	81	82	83	84	85	86
310	38	41	43	46	48	51	53	55	57	59	61	63	64	66	68	69	71	72	74	75	76	78	79	80	81	82	83	84	85	86	87
320	38	41	44	46	49	51	53	56	58	60	62	63	65	67	69	70	72	73	75	76	77	79	80	81	82	84	85	86	87	88	89
330	38	41	44	47	49	52	54	56	58	60	62	64	66	68	69	71	73	74	76	77	79	80	81	83	84	85	86	87	88	89	90
340	39	42	44	47	50	52	54	57	59	61	63	65	67	69	70	72	74	75	77	78	80	81	82	84	85	86	87	89	90	91	92
350	39	42	45	47	50	53	55	57	59	62	64	66	68	69	71	73	75	76	78	79	81	82	84	85	86	88	89	90	91	92	93
360	39	42	45	48	50	53	55	58	60	62	64	66	68	70	72	74	75	77	79	80	82	83	85	86	87	89	90	91	92	94	95
370	39	42	45	48	51	53	56	58	61	63	65	67	69	71	73	75	76	78	80	81	83	84	86	87	89	90	91	93	94	95	96
380	40	43	46	48	51	54	56	59	61	63	66	68	70	72	74	75	77	79	81	82	84	85	87	88	90	91	92	94	95	96	97
390	40	43	46	49	52	54	57	59	62	64	66	68	70	72	74	76	78	80	81	83	85	86	88	89	91	92	94	95	96	98	99
400	40	43	46	49	52	55	57	60	62	64	67	69	71	73	75	77	79	81	82	84	86	87	89	90	92	93	95	96	97	99	100



Example:

Existing compressive stress $\sigma_{m,k}$: 7 N/mm²
Selected bearing length l: 120 mm
Selected bearing width b: 120 mm
Selected bearing thickness t: 15 mm

Auxiliary value from table on page 6: 30

Shape factor S:

$$S = \frac{\text{Aux. value table on page 6}}{\text{Selected bearing thickness}} = \frac{30}{15} = 2$$

From the graph on the left hand side:

Compact Bearing S 70

The unreinforced Perforated Bearing cannot be used as it is not available in the required thickness of 15 mm i.e. it needs to be checked if the required bearing thickness is available or the next possible bearing thickness has to be chosen.

The exact design is carried out according to the product information.

Choice of Bearing by Shape Factor

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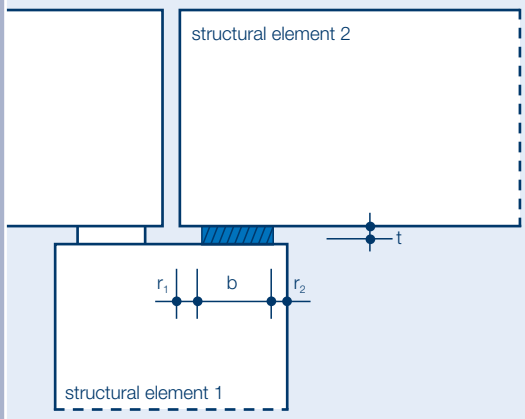
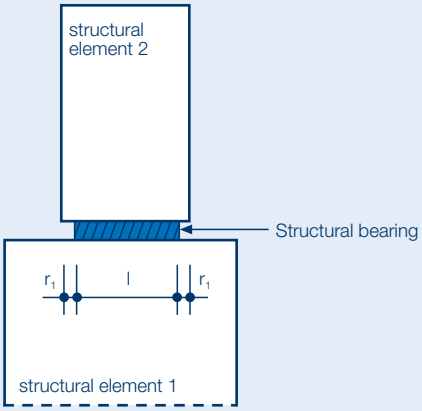
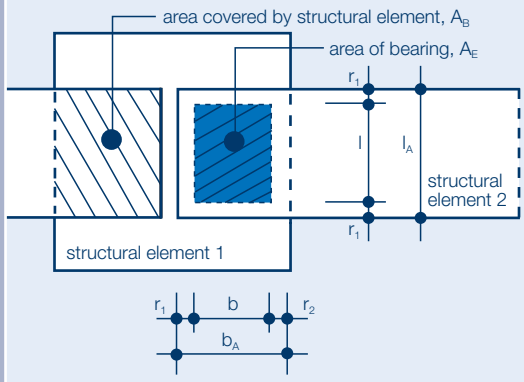
Edge Distances



Side view



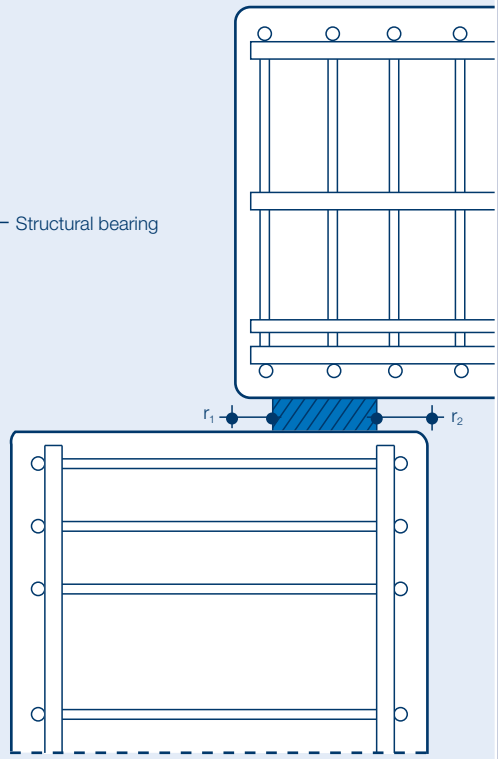
Front view



Plan view

Notation

l = bearing length
b = bearing width
t = bearing thickness (= height of construction)
l_A = length of area covered by structural element
b_A = width of area covered by structural element
r_i = edge distance from bearing (= distance from the bearing edge to the outer edge of the structural element)



Edge distance from the bearing for reinforced concrete elements

r_i = Distance from outer edge of the structural element to inner edge of the reinforcing bar.

Maximum size of plan area of an elastomeric bearing for reinforced concrete construction (edge distance). DIN 1045-1 and Heft 525 of the DAfStb (German Committee for Structural Concrete) are to be adhered to. For timber or steel members the edge distance shall be at least 3 cm.

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