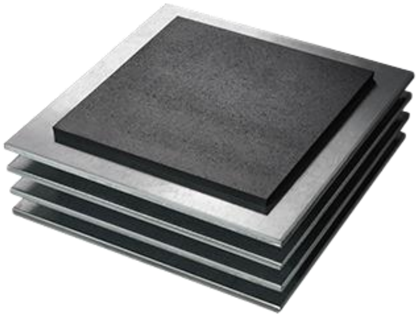
ELASTOMER SERVICE ZENTRALE
WILFRIED BECKER GMBH

ESZ Type 200 Composite

Steel-reinforced structural bearing

Load capacity up to **37 N/mm²**



ESZ Type 200 Composite | for static component storage
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Special advantages

- Load-bearing capacity up to 37 N/mm² (depending on format)
- Materials: Vulcanisate based on CR rubber/steel S235 JR
- Bearing thickness up to 65 mm
- Maintenance-free and very durable
- Low creep behaviour
- Very good mechanical-physical characteristics

Description

ESZ Type 200 Composite is a steel-reinforced structural bearing with compact elastomer layers made of a vulcanisate based on chloroprene rubber (CR), combined with reinforcement layers made of S235 JR steel, which are 20 mm larger than the elastomer layers all round.

Intended use

The area of application is intended for the static support of components, in particular for **large bearing heights.** It is used in accordance with the provisions of the former general building inspectorate approval **Z-16.33-513**.
The use of foils above and below the bearing is not permitted.

Deformation

The deformation depends on the nature of the contact surfaces, the compressive stresses acting on them and the shape factor S.

Contact surfaces

The design data apply to the use of bearings between reinforced concrete contact surfaces.

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Temperature range

The temperature application range is between -25 °C and +50 °C.
The bearings may be exposed to temperatures of up to +70 °C for short, recurring periods of less than 8 hours.

Delivery form

As blanks for all standard reinforced and prestressed precast concrete construction elastomer base surfaces with drill holes.
Total bearing height t = 15 / 25/30 / 35 / 40 / 45 / 50 / 55 / 60 and 65 mm.

Boreholes

Up to four boreholes are permitted per bearing, whereby the surface area of the drill holes may not exceed 10 % of the total surface area of the bearing and the borehole diameter may not exceed 50 mm. The distance between the holes must be at least 2 x D.
An edge distance of at least 30 mm must be selected for the drill hole.

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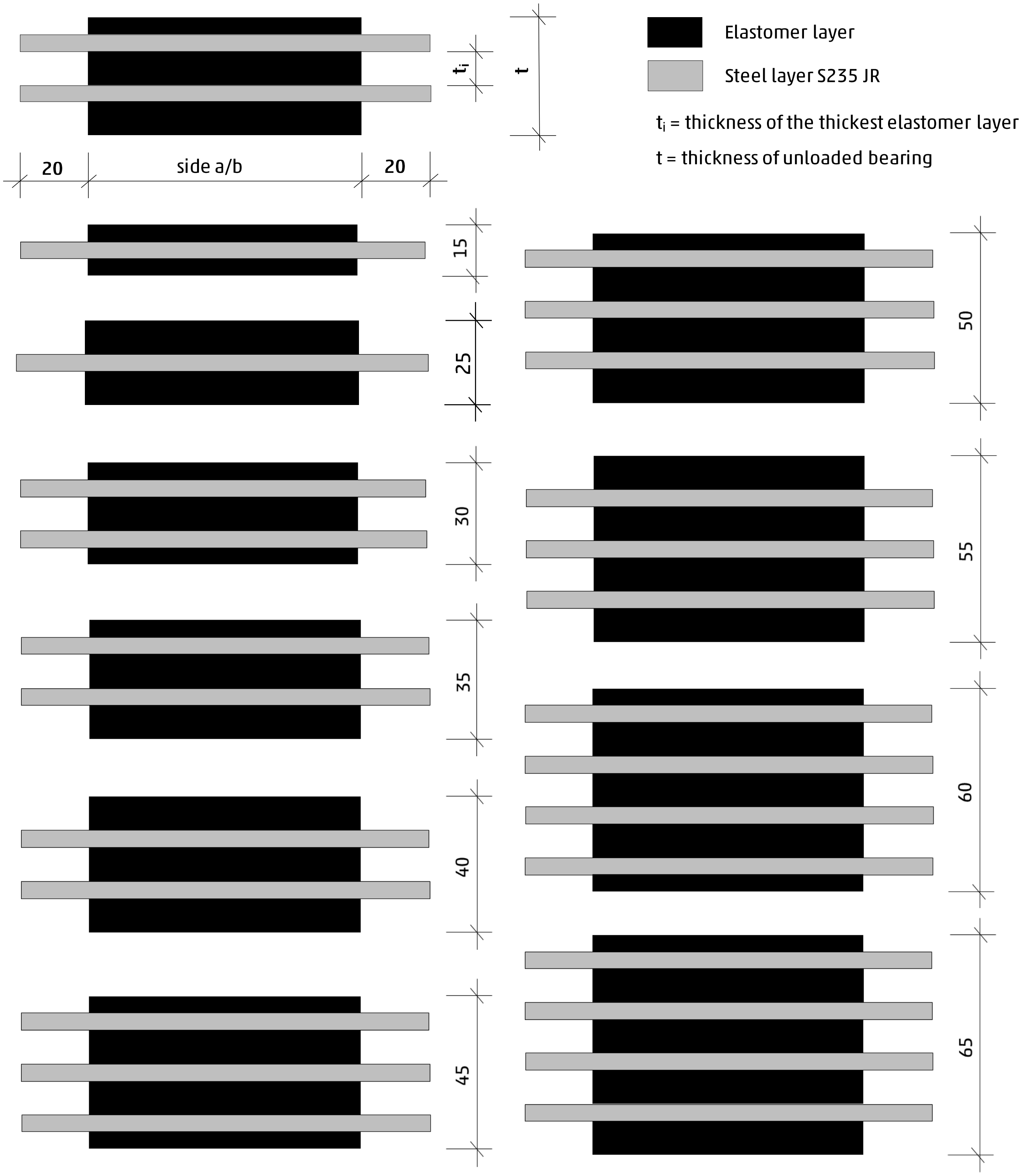

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Design table load capacities				
a x b [mm]	t total thickness of the bearing [mm]	S [-]	$\sigma_{z,Rd}$ [N/mm^2]	$F_{z,rd}$ [kN]
90x90	15, 25, 30, 35, 40, 45, 50, 55, 60, 65	4,50	37,0	300
		2,25	27,3	221
100x100		5,00	37,0	370
		2,50	31,6	316
100x150		6,00	37,0	555
		3,00	37,0	603
100x200		6,67	37,0	740
		3,33	37,0	918
150x150		7,50	37,0	833
		3,75	37,0	1.194
150x200		8,57	37,0	1.110
		4,29	37,0	1.868
150x300		10,00	37,0	1.665
		5,00	37,0	3.354
200x300		12,00	37,0	2.220
		6,00	37,0	2.100
300x300		15,00	37,0	3.330
		7,50	37,0	3.150
350x350		17,50	37,0	4.533
		8,75	37,0	4.288
400x400		20,00	37,0	5.920
		10,00	37,0	5.600

Other formats are possible (see ESZ dimensioning tool)
S = shape factor according to Table 1 of the DIBt approval
The shape factor is calculated from the thickest elastomer layer (ti) of the respective bearing structure.
For all bearing heights, the calculated minimum pressure must not be less than 5 N/mm^2.

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<table>
<tr><th colspan="11">Dimension limits [mm]</th></tr>
<tr><td>t</td><td>15</td><td>25*</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td><td>55</td><td>60</td><td>65</td></tr>
<tr><td>T</td><td>10</td><td>20</td><td>20</td><td>25</td><td>30</td><td>30</td><td>35</td><td>40</td><td>40</td><td>45</td></tr>
<tr><td>a_{min}</td><td>90</td><td>100</td><td>100</td><td>125</td><td>150</td><td>150</td><td>175</td><td>200</td><td>200</td><td>225</td></tr>
<tr><td>a_{max}</td><td>300</td><td colspan="9">600</td></tr>
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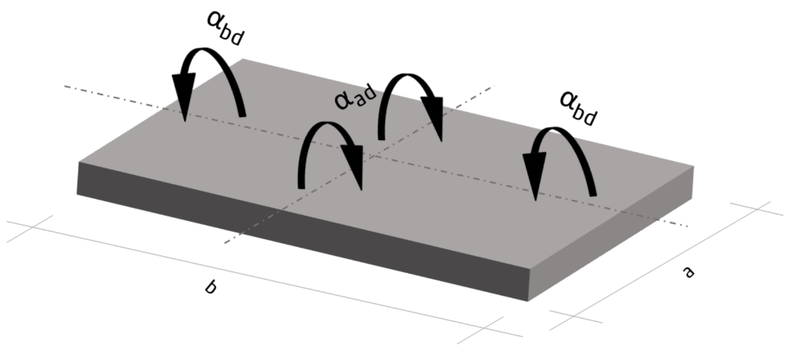
t = total thickness of the unloaded bearing
T = total thickness of the elatomer layers



<table>
<tr><th>Rotation α [‰]</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td>total bearing thickness t [mm]</td><td>15</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td><td>55</td><td>60</td><td>65</td></tr>
<tr><td>thickness elastomer layers T [mm]</td><td>10</td><td>20</td><td>20</td><td>25</td><td>30</td><td>30</td><td>35</td><td>40</td><td>40</td><td>45</td></tr>
<tr><td>bearing side subjected to torsion a or b [mm]</td><td colspan="10"></td></tr>
<tr><td>90</td><td>33</td><td rowspan="4">40</td><td rowspan="4">40</td><td rowspan="5">40</td><td rowspan="6">40</td><td rowspan="6">40</td><td rowspan="7">40</td><td rowspan="8">40</td><td rowspan="8">40</td><td rowspan="8">40</td></tr>
<tr><td>100</td><td>30</td></tr>
<tr><td>125</td><td>24</td></tr>
<tr><td>150</td><td>20</td></tr>
<tr><td>175</td><td>17</td><td>34</td><td>34</td></tr>
<tr><td>200</td><td>15</td><td>30</td><td>30</td><td>38</td></tr>
<tr><td>225</td><td>13</td><td>27</td><td>27</td><td>33</td></tr>
<tr><td>250</td><td>12</td><td>24</td><td>24</td><td>30</td><td>36</td><td>36</td></tr>
<tr><td>275</td><td>11</td><td>22</td><td>22</td><td>27</td><td>33</td><td>33</td><td>38</td></tr>
<tr><td>300</td><td>10</td><td>20</td><td>20</td><td>25</td><td>30</td><td>30</td><td>35</td></tr>
<tr><td>350</td><td>9</td><td>17</td><td>17</td><td>21</td><td>26</td><td>26</td><td>30</td><td>34</td><td>34</td><td>39</td></tr>
<tr><td>400</td><td>8</td><td>15</td><td>15</td><td>19</td><td>23</td><td>23</td><td>26</td><td>30</td><td>30</td><td>34</td></tr>
<tr><td>450</td><td>7</td><td>13</td><td>13</td><td>17</td><td>20</td><td>20</td><td>23</td><td>27</td><td>27</td><td>30</td></tr>
<tr><td>500</td><td>6</td><td>12</td><td>12</td><td>15</td><td>18</td><td>18</td><td>21</td><td>24</td><td>24</td><td>27</td></tr>
<tr><td>550</td><td>5</td><td>11</td><td>11</td><td>14</td><td>16</td><td>16</td><td>19</td><td>22</td><td>22</td><td>25</td></tr>
<tr><td>600</td><td>5</td><td>10</td><td>10</td><td>13</td><td>15</td><td>15</td><td>18</td><td>20</td><td>20</td><td>23</td></tr>
</table>

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ESZ Type 200 Composite | for static component storage
Technical documentation

Supply and installation of steel-reinforced elastomeric bearings **ESZ Type 200 Composite** between precast reinforced concrete elements.
The mathematical verification of the usability of the bearings must be provided.

Bearing type: ESZ Type 200 Composite with former building authority approval Z-16.33-513

Bearing thickness :______ mm (t = 15 / 25 / 30 / 35 / 40 / 45 / 50 / 55 / 60 and 65 mm

Storage format :______ mm x ______ mm (a x w)
Drill holes :______ piece
Diameter: ______ mm

Quantity :______ piece

Proof of purchase: ESZ Wilfried Becker GmbH
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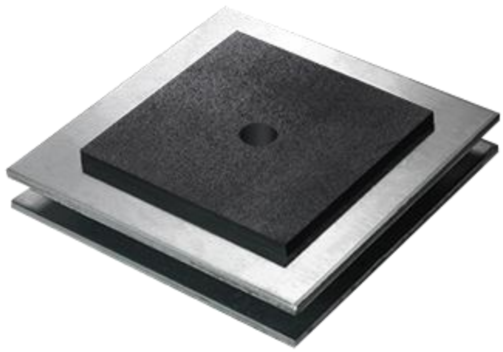

ESZ Type 200 Composite | with national technical approval
General information and calculation basics

Conditions > Dimensions of the bearings and permissible boreholes (according to abZ section 2.1.1)

Thickness of the bearing **t = 15 to 65 mm**

a_{max} = b_{max} = **600 mm**

The following applies to rectangular bearings:
a ≥ 90 mm, b ≥ 90 mm

with

- **t** **thickness** of the unloaded bearing
- t_i thickness of the thickest elastomer layer
- **a** shorter side of the bearing
- **b** longer side of the bearing

In Table 1 of the general building inspectorate approval, the load-bearing capacities are listed as a design function for different load-bearing capacities ahape factor ranges.

The **shape factor S** for rectangular bearings is calculated as follows:

$$S = \frac{a \cdot b}{2 \cdot t \cdot (a + b)}$$

Boreholes (base and lateral surfaces) must still be taken into account (=deducted) in the calculation!

Up to four boreholes are permitted per bearing, whereby the area of the boreholes may not exceed 10 % of the total area of the bearing.

The distance between the drill holes must be at least 2 x D. A minimum edge distance of 30 mm (from the edge of the steel sheet) must be maintained for the drill holes. The maximum diameter of the hole is D = 50 mm.

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General information and calculation basics

Calculation of the load-bearing capacity and consideration of the angle of rotation incl. surcharges

The load-bearing capacity of the **ESZ Type 200 Composite is** limited by the manufacturer to **37 N/mm²**, although the design function in Table 1 of the approval indicates significantly higher load-bearing capacities depending on the form factor.
If the specific support situation is known and in direct consultation with ESZ, higher pressures may also be possible.

The vertical load on an elastomeric bearing leads to a **centric** load concentration and, in conjunction with a support torsion, to an **eccentric** load concentration.
The simultaneous occurrence of compressive stress and rotation must be taken into account when dimensioning an elastomeric bearing and its suitability for use must be verified accordingly.
The resulting effects on the neighbouring components must also be considered.
For the bearing design, the shear stresses from the vertical compression and the torsion are superimposed.
Elastomeric bearings allow shear deformation, but they must not be used to **absorb constant external shear forces.**

- obliqueness with 10 ‰
- unevenness with 625/a ‰

In the case of torsion across both sides of the bearing, the surcharges for angular torsion are added proportionally to the respective design data (torsion due to component deformations) from the structural analysis.

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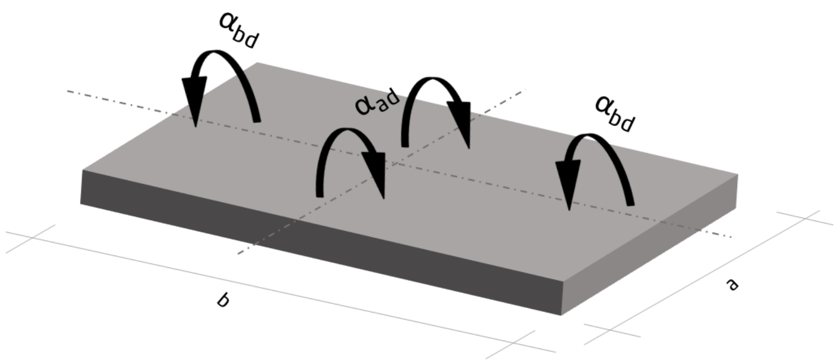
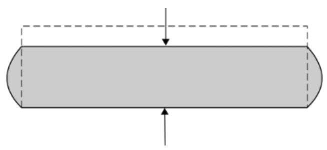
General information and calculation basics



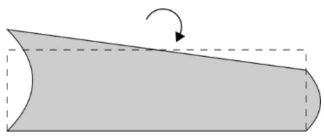
$$\alpha_{b,max} = \frac{300 \cdot t}{a} \leq 40\ ‰ \qquad \alpha_{a,max} = \frac{300 \cdot t}{b} \leq 40\ ‰$$

$$\alpha_{Res.} = \sqrt{\alpha_{a,max}{}^2 + \alpha_{b,max}{}^2} \leq 40\ ‰$$

The interaction of load action and angular torsion leads to a reduction in load-bearing capacity.



Deviations from the plane parallelism and unevenness of the contact surfaces of the adjacent components are treated mathematically as planned rotations. Geometric imperfections and deviations from the plane parallelism of the contact surfaces must be recognised with at least 0.01 rad [= 10 ‰] and added to the calculated value of the bearing torsion.



If no more precise verification is provided, unevenness of the contact surfaces must be taken into account with 625/a [‰] and calculated in the same way as planned rotations. Bearing side a is always the shorter bearing side.
If in situ concrete component is concreted onto the bearing or the contact surface is steel, this value can be halved.

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ESZ Type 200 Composite | with general building authority approval
General information

Information on transverse tensile forces in the bearing joint

The elastomeric part of the bearing **ESZ type 200 Composite** is practically incompressible. As a result, the bearing expands transversely under compressive load at constant volume. The bearing is more or less restricted in its transverse expansion by the neighbouring components - depending on the surface properties of the component.
Roughness and **surface friction** are decisive influencing factors here. If the adjacent surfaces now counteract the lateral expansion of the elastomer bearing, this inevitably results in shear stresses in the joint, which lead to tensile stresses in the adjacent material and compressive stresses in the rubber.
These so-called adhesive tensile stresses in the adjacent (concrete) component are unfavourable because they can lead to damage such as edge spalling.

They increase with increasing elastomer thickness and should not be confused with splitting tensile stresses, which only become effective at a certain depth and occur with any type of partial surface load.
The reinforcement for the transverse tensile forces in reinforced concrete components should therefore be arranged as close as possible to the bearing.

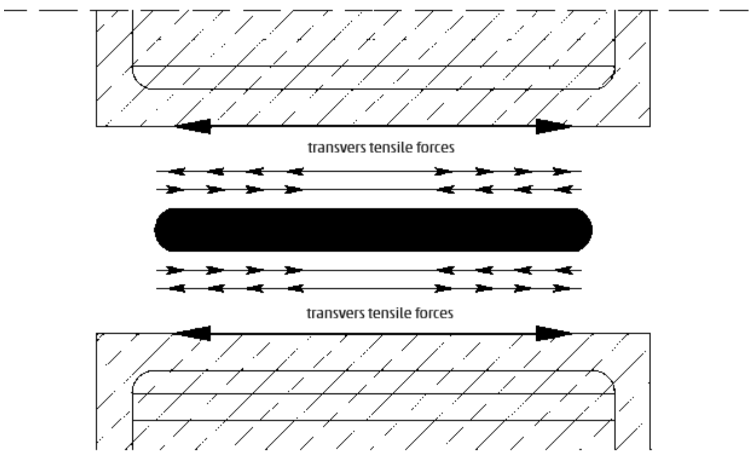

Fig.1 : Representation of the transverse tensile

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- The environmental influences must be checked with regard to possible damage to the bearings.
- Elastomer bearings and bearing surfaces must be free of dirt. Loose particles are not permitted.
- The bearing surfaces must be free of ice and snow, grease, solvents, oils or release agents. This must be ensured by suitable measures.
- The bearing surfaces must be carefully deburred to protect the bearing.
- The alignment of the bearing surfaces must be checked. If necessary, the support surfaces must be reworked to bring them into the planned condition.
- The alignment of the bearing surfaces must be checked. If necessary, the support surfaces must be reworked to bring them into the planned condition.
- Individual surface imperfections must not exceed 100 mm² and must not deviate more than 2.5 mm in depth from the surrounding surface. The total area of the surface imperfections must not exceed 10 %.
- The bearing areas must be designed in accordance with the design-specific technical specifications and standards. Generally, edge distances must be provided. The elastomeric bearing should always be located within the reinforcement, even after expansion due to compressive stress.
- When using the bearings on steel contact surfaces, the steel surfaces should be at least 25 mm larger all round than the bearing.
- If the elastomeric bearings are tamped underneath, particular attention must be paid to the quality of the mortar. Elastomeric bearings must not be overloaded at certain points. The load of the structure to be supported by the bearings must not be applied directly to the bearing solely via wedges, unless a sufficiently rigid steel plate is interposed to distribute the load. The wedges must be removed again once the padding material has hardened.
- The lateral surfaces of the bearings must not be hindered in their planned deformation.
- Each component must be separated horizontally and vertically from the neighbouring components by joints in such a way that the intended support (statics) can be effective. It should be noted that joint fillings, e.g. joint compounds, foam profiles or mineral wool or foam panels, can impair deformability. In the case of in-situ concrete, proper production of the bed joint must be ensured.
- In the case of horizontally movable components, it must be checked whether fixed points or fixed zones must be arranged to determine the zero point of movement of the component to be stored. It should be noted that unintended fixed points can have a detrimental effect on component storage.
- The arrangement of several storage units on top of each other (stacking) is not permitted.

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