Deutsches Institut für Bautechnik

DIBt

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

National technical approval / General construction technique permit

Date: 17 March 2020

Reference: I 32-1.16.32-7/19

Number:
Z-16.32-495

Validity
from: **17 March 2020**
to: **27 April 2023**

Applicant:

Calenberg Ingenieure GmbH
Am Knübel 2-4
31020 Salzhemmendorf, Germany

Subject of decision:
Calenberg Cibatur

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*).
This decision contains eight pages.
This national technical approval / general construction technique permit replaces national technical approval / general construction technique permit no. Z-16.32-495 of 27 April 2018. The subject concerned was granted the first national technical approval on 27 April 2018.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).

2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.

3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.

4 Without prejudice to further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.

5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.

6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.

7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.

8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

The subject of approval is the profiled unreinforced elastomeric bearing 'Cibatur' used to transfer forces and to compensate deformations perpendicular to the bearing plane. 'Cibatur' consists of a fabric-reinforced elastomer sheet with truncated cone-shaped spring elements on its underside. The spring elements are evenly distributed in a rectangular pattern across the bearing's underside. The following materials are used: natural rubber (NR), styrene butadiene rubber (SBR) and a CR/SBR compound. The bearings are rectangular. They may be supplied in point, strip or full surface form. Two 'Cibatur' bearings may be arranged one above the other if the at least 2.8 mm thick PVC sheet, which is part of the system, is used as a separating layer.
The subject of the permit is the planning, design and execution of the elastomeric bearings in buildings and other civil engineering works. The elastomeric bearings may be used at temperatures between -25 °C and 50 °C. The bearings may be exposed to temperatures up to +70 °C for short-term recurring periods of less than 8 hours.

Although elastomeric bearings enable shear strain, they shall not be used for the planned transfer of constant external shear forces.

Vibration insulation-related aspects and structure-borne sound insulation are not assessed in this decision.

2 Provisions for the bearings

2.1 Properties and composition

2.1.1 Dimensions

For the bearing dimensions, the following conditions shall be complied with:

Bearing thickness:

Single layer:

t = 30 mm

a ≥ 128 mm

b ≥ 128 mm

where:

t	thickness of unloaded bearing	[mm]
a	short side of bearing	[mm]
b	long side of bearing	[mm]

Regarding the tolerances to be adhered to:

length	class L3 in accordance with Table 6 of DIN ISO 3302-1:1999
width	class L3 in accordance with Table 6 of DIN ISO 3302-1:1999
thickness	tolerance of ± 2.5 mm

2.1.2 Materials

The physical characteristics, the chemical composition as well as the material properties of the bearings and the PVC sheet are deposited with DIBt.

The properties of the starting materials used shall be verified through inspection certificate type 3.1 in accordance with DIN EN 10204:2005-01.

2.2 Manufacture, transport and marking

2.2.1 Manufacture and transport

The bearings shall be produced in the shape of rolls and then be cut to size as needed.

Detailed information on the manufacturing process is deposited with DIBt.

2.2.2 Marking

The manufacturer shall affix the national conformity mark (*Ü-Zeichen*) to the construction product in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the requirements given in Section 2.3 are met. When applied accordingly, the marking shall be permanent with continuous labelling on the rolls produced in accordance with Section 2.2.1.

2.3 Confirmation of conformity

2.3.1 General

The confirmation of conformity of the bearings with the provisions of the national technical approval included in this decision shall be issued for every manufacturing plant in the form of a certificate of conformity based on factory production control and regular external surveillance including initial type-testing of the bearings in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the bearings shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark (*Ü-Zeichen*) including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

A copy of the initial type-testing evaluation report shall also be sent to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products meet the provisions of the national technical approval included in this decision.

Factory production control shall be carried out in accordance with the test plan deposited with DIBt.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material and the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- result of the checks and tests as well as, if applicable, comparison with requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately – where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The plant and the factory production control system shall be inspected regularly, i.e. at least twice a year, by means of external surveillance at each manufacturing plant of the bearings.

Initial type-testing of the bearing shall be carried out within the scope of external surveillance. Samples shall also be drawn at random for testing. Sampling and testing shall be the responsibility of the recognised inspection body.

The scope and frequency of external surveillance shall be taken from the test plan deposited with DIBt.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

The bearings may be installed in one layer or two layers. In case of a two-layer arrangement, the bearings' thickness shall be t = 2 x 30 mm + 2.8 mm = 62.8 mm. The dimensions of the bearings shall be taken from the designer's specifications and the installation plans.

Structural analysis shall be carried out in each individual case to verify the stability of the bearings in the ultimate limit state for all relevant design situations and load cases.

The verification concept set out in DIN EN 1990:2010-12 in conjunction with the National Annex shall apply.

The dimensions and arrangement of the bearings shall result from the structural requirements. Based on the bearing selection, an installation plan which shows the exact position of the bearings in the structural layout shall be drawn up if the installation situation so requires.

3.2 Design

The possible load case combinations shall be taken from DIN EN 1990:2010-12.

The design values of the effects of the actions (loads) E_d shall be determined from the characteristic values of the actions in consideration of the partial safety factors γ_f and the combination coefficients ψ in accordance with the Technical Building Rules.

In the ultimate limit state, the following verification shall be provided:

$$\frac{E_{\perp d}}{R_{\perp d}} \leq 1$$

where:

$E_{\perp d}$ load acting on bearing perpendicular to the bearing plane [N/mm²]

$R_{\perp d}$ design value of associated bearing resistance [N/mm²] perpendicular to bearing plane depending on the number of spring elements n for a compressive strain of ε = 40 % or ε = 56 % in accordance with Table 1

n number of spring elements

Table 1: Bearing resistance for loads perpendicular to bearing plane for point and strip bearings

Maximum compressive strain ε [%]	**Number of spring elements n**	**Function for determining** the design value of resistance [N/mm²]
one-layer and two-layer installation with spring elements arranged one above the other		
40	n ≥ 4	$R_{\perp d} = 0.17$
56	4 ≤ n ≤ 25	$R_{\perp d} = 0.9 \cdot n^{0.21}$
56	n > 25	$R_{\perp d} = 1.77$
two-layer installation with spring elements arranged one above the other in an offset manner		
50	n ≥ 16	$R_{\perp d} = 0.70$

The function for determining the design value of resistance shall apply to bearings without drilled holes.

The material partial safety factor for a compressive strain of

- ε = 40 % is $\gamma_{m,40\%} = 1.43$,
- ε = 56 % is $\gamma_{m,56\%} = 1.44$,
- ε = 50 % is $\gamma_{m,50\%} = 1.10$.

The structural members adjacent to the bearing shall be designed such that the interaction with the structural behaviour of the bearing is taken into account. It shall be observed that loading of an elastomeric bearing leads to a load concentration. Rotation of the elastomeric bearings leads to eccentricities in the load concentration and hence to a restoring moment. The transverse tensile force arising in the adjacent structural members as a result of the strain constraint of the unreinforced elastomeric bearing shall be verified and transmitted through corresponding measures.

The compressive strain of the bearing shall be taken into account as a product-specific value in the determination of the actions on the overall structure. If the contact surfaces of the adjacent structural members deviate from planar parallelism, e.g. as a result of manufacturing and installation tolerances, these deviations shall be taken into account in the design of the bearing. If more detailed verification is not provided, the angle of rotation of the adjacent structural members shall be determined through adding of the following factors:

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

If the adjacent structural members are made of steel or in-situ concrete, the unevenness may be halved.

For rotations on both perpendicular sides of the bearing, amounts for angular displacement shall be proportionally added to the respective design values.

The positional stability shall be verified.

For bearings having a rectangular base area, the maximum twist for rotation about an axis shall be determined as follows:

$$\alpha_{b,max} = 0.5 \cdot \frac{t}{a} \leq 40\ ‰$$

where:

$\alpha_{b,max}$ maximum angle of twist for rotation about the central axis parallel to side b

The formula shall be used analogously for determination of the maximum angle of twist about the central axis parallel to side a. Verification that edge contact with the adjacent structural members is avoided at simultaneous occurrence of the maximum compression and the maximum twist shall be provided during the structural design.

For biaxial torsional stress, the following boundary condition shall be adhered to:

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

The transverse tensile force acting on the adjacent structural members due to the central load acting on the bearing is distributed over the individual spring elements of the bearing. The maximum occurring transverse tensile force from an individual spring element may be determined using the equation below. The adjacent structural member shall be able to transfer this force. The transverse tensile forces from the individual spring elements do not need to be added up for these forces act independently.

$$Z_{o,spring\ element} = 2.67 \cdot \frac{E_{\perp d} \cdot a \cdot b}{n \cdot \pi}$$

where:

$Z_{o,spring\ element}$ radial transverse tensile force from an individual spring element

The bulging of the bearing depends on its size and shape. During the structural design (edge distances etc.) the bulging of the bearing shall be taken into account and requested from the manufacturer in advance.

The lateral surfaces of the bearing may not be hindered in their planned deformation.

3.3 Execution

Regarding the transport of the bearings the manufacturer's specifications shall be observed.

The bearings shall be stored and installed in a dry condition. The bearings shall be protected from direct sunlight. The substrate shall be smooth and level. The support surfaces shall be carefully deburred for protecting the bearing. Voids in the adjacent concrete surfaces shall be avoided. If necessary, height compensation may be carried out by means of a suitable mortar bed. The adjacent structural members shall be compatible with the bearing material. It shall be ensured that the bearing and the adjacent structural members are kept free of damaging chemical and physical effects as well as contaminants. The surfaces of the adjacent structural members shall be swept clean and free of snow, ice, grease and bond breakers. Stagnant water shall be avoided.

The manufacturer's specifications regarding installation shall be observed.

The executing company shall provide a declaration of conformity in accordance with Sections 16a(5) and 21(2) of the Model Building Code to confirm the conformity of the installed bearing with the general construction technique permit included in this decision.

4 Provisions for use, maintenance and repair

The bearings shall be installed such that they are maintenance-free.

Andreas Schult
Head of Section

Drawn up by