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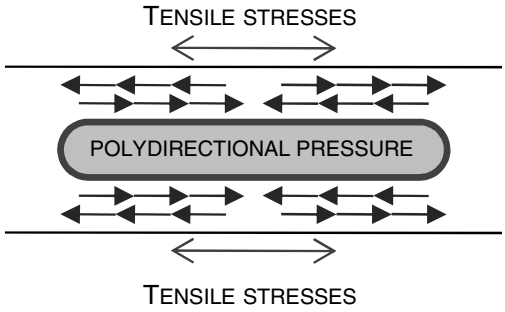
ESZ Type C-20-E

Unreinforced elastomer bearing
with general supervisory test certificate

Load perpendicular to the plane of the bearing:
INFORMATION ABOUT TRANSVERSE TENSILE FORCES IN THE BEARING JOINT

The ESZ Type C-20-E is practically incompressible.
Hence, it follows that the type C-20-E expands transversely to the compressive load while the volume remains constant. The bearing is hindered in this transverse expansion to a greater or lesser degree by the adjacent structural elements. (Surface friction). If the adjacent surfaces now prevent the lateral expansion of the elastomer, this must inevitably result in shear stresses in the joint, which leads to tensile stresses in the adjacent material and to compressive stresses in the rubber.
These so-called adhesive tensile stresses in the adjacent material are unwanted. They become larger with increasing elastomer thickness and must not be confused with splitting tensile stresses, which only take effect at a certain depth and occur with all forms of partial area loading. The reinforcement for the transverse tensile forces in reinforced concrete elements is to be arranged as close as possible to the bearing. Attention must still be paid to concrete coverage, however.



CALCULATION OF THE TRANSVERSE TENSILE FORCES IN THE BEARING JOINT

Bearing class 2 according to DIN 4141-3:

For simplicity's sake we assume here that the supporting force is transmitted into the adjacent structural elements distributed to a 0.3xa deep strip at the exterior edge of the bearing. The transverse tensile force resulting from the lateral expansion of the elastomer may be calculated as follows:

$$Zq = 1{,}5 \times F \times t \times a \times 10^{-5}$$

with a and t in [mm]
[DIN 4141-15 5.3 (2)].

The transversely-directed tensile forces Z_q thus determined must be verified in the adjacent structural elements: e.g. through appropriate reinforcement in the case of reinforced concrete.

Design example:

The determination is as follows for an ESZ type C-20-E with dimensions of 200x100x15 mm and with an applied load of 10,0 N/mm²:

Given variables: F = 200 kN
a = 200 mm
b = 100 mm
t = 15 mm

Transverse direction:

$Z_q = 1{,}5 \; x \; 200\,kN \; x \; 15\,mm \; x \; 200 \; x \; 10^{-5}$

$Z_q = 9{,}0\,kN$

Longitudinal direction:

$Z_q = 1{,}5 \; x \; 200\,kN \; x \; 15\,mm \; x \; 100 \; x \; 10^{-5}$

$Z_q = 4{,}5\,kN$