Siroflex
Quality Performance Products

Technical bulletin

Joint dimensions, joint constructions and use of backer rod

Both inside and outside of building structures joints are used. These might include:

- Joints, for example, between frame / wall
- Expansion joints, for example, between concrete slabs themselves

These joints are knowingly provided in the structure to absorb expansions and contractions. The joints have in common that they are narrower and wider by operation of the structure in which they are located. This effect may be caused by:

1. Vibrations caused by traffic loads, machines;
2. Deflection of the structure by wind load;
3. Expansion and contraction of building materials by contracting and extracting moisture;
4. Expansion and contraction of building materials by temperature changes (thermal expansion and contraction).

While drawing the design of the building, these operations will have to be taken into account, and both the length of structural parts as the width of the joints have to be chosen in such a way no overloading of the seal material will take place.

Although the causes mentioned under 1, 2 and 3 can, under certain circumstances, exert a significant effect on the joints, in most cases the greatest effects are caused due to thermal expansion and contraction of the materials.

This is how it works
All materials have their own specific expansion coefficient that can be found in technical manuals or can be specified by suppliers. Table 1 lists various materials and their indicated expansion coefficients. This shows there are large differences between the expansion coefficients of the various materials. For instance plastics extract 8 to 10 times as glass. For more extraction coefficients see Table 1.

In the right column of table 1 the extraction / contraction of material are given. These values account for a length of 1 metre and a temperature difference of 100°C. With these data the amount of extraction/contraction for specific construction parts, with practically occurring differences in temperature, can be calculated.

Example
Concrete slab of 5 metre length. Practically the maximum temperature of the concrete will be +30°C, the minimum temperature -10°C. So the difference in temperature is 40°C.

1 metre concrete / 100° temp. difference = 1,2 mm operation
5 metre concrete / 100° temp. difference = 6,0 mm operation
5 metre concrete / 40° temp. difference = 2,4 mm operation

The calculated operation is 2,4 mm. This force will also be present in the joint. By sealing the joint with an elastic sealant which durably allows max.25% deformation, the minimal width of the joint is: (100/25) x 2,4 mm = 9,6 mm
Besides the right width of the joint, also the depth is important. This depth depends on the width and can be calculated by the formula below.

↔joint depth = (Joint width/3) + 6 mm

So with a joint width of 18 mm the right joint depth is:
(18/3) + 6 mm = 12 mm

To apply the sealant in the right depth backer rod is used
(see drawing A)

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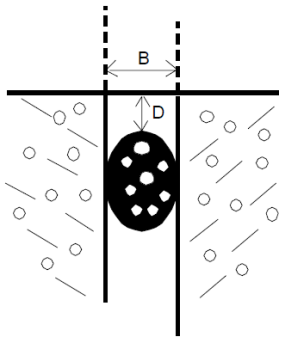

Drawing A

Materials used as backer rod should be weaker that the sealant itself and not obstruct the movement of the sealant whilst compressing or extracting.

The rounded shaped of the foam creates a good dimension of the joint. Relatively big bonding surface compared to the thinner layer in the middle of the sealant-joint. Generally PU Backer rod is used in non-mechanical or water exposed joints (for example façade joints). PE Backer rod us used in mechanical or joints exposed to water. The use of PE Backer rod is more critical than PU Backer rod. Damages on PE Backer rod during application in the joints can release propellant, which can cause blistering in the sealant joint. Also possible air locked in between the PE backer rod and the sealant can create blisters due to direct sunlight.

Backer rods of wooden battens, rubber hoses, 1-component Polyurethane foam, etc. are not suitable for expansion joints. Polystyrene foam is less suitable, especially when bonding primer must be applied in the joint. The polystyrene can be resolved by the primer.

When the depth of the joint is too small to use backer rod, self-adhesive PE foam tape can be used, or a PE foil. The cured sealant will not bond to Polyethylene, preventing bonding to 3 surfaces, allowing the sealant to freely move in the joint.

MATERIAL	**Linear extraction coefficient per °C**	**Extraction of 1 metre material with a temperature difference of 100°C**
Concrete	12×10^{-6}	1,2 mm
Aerated concrete	12×10^{-6}	1,2 mm
Limestone	12×10^{-6}	1,2 mm
Front vowel	7×10^{-6}	0,7 mm
Marble	7×10^{-6}	0,7 mm
Steel	12×10^{-6}	1,2 mm
Aluminium	24×10^{-6}	2,4 mm
Glass	8×10^{-6}	0,8 mm
Polyester (fiberglass reinforced)	30×10^{-6}	3,0 mm
Polyester	80×10^{-6}	8,0 mm
PVC	80×10^{-6}	8,0 mm
PMMA (polyacrylate)	80×10^{-6}	8,0 mm
Polycarbonate	80×10^{-6}	8,0 mm

Table 1

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