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Joint dimensions, joint construction and use of backer rod

FACTSHEET

Bostik_FactSheets-FS008_GBU_C&C_Sealing & Bonding_082023

GLOBAL LEADER IN ADHESIVE TECHNOLOGIES
Bostik is one of the largest adhesive and sealant Bostik is one of the largest adhesive and sealant companies. Worldwide, we employ some 6,000 people in 50 countries across five continents. Our customers come from diverse markets, most notably the industrial manufacturing, construction and consumer sectors.

SMART INNOVATIONS
Our smart identity is underpinned by innovation. We pursue innovation vigorously, applying the latest technological advances to developing 'smart' adhesives. Our archives are laden with examples of Bostik technologies that have disrupted markets - from potato starch-based wallpaper paste to elastic attachment adhesive for diapers.

Today, our commitment to innovation is as strong as ever. We innovate with our customers through a global R&D network, comprising three international Smart Technology Centres and 8 regional centres. And we differentiate our business through this investment.

Joint dimensions, joint construction and use of backer rod

GENERAL INFORMATION
Joint structures are used in both the interior and exterior of buildings. These include:
- Joints, e.g., between frame / wall
- Expansion joints, e.g., between concrete slabs

These joints are knowingly placed in the structure in order to absorb expansion and contraction. The joints become 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 designing the building, these operations will be taken into account, and both the length as the width of structural parts of the joints will be chosen in such a way as not to overload the seal material. 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 by thermal expansion and contraction of the materials.

THIS IS HOW IT WORKS
All materials have their own specific expansion co-efficiency that is found in technical manuals or is be specified by suppliers. Table 1 lists various materials and their indicated expansion co-eff-iciency. This shows the large differences between the expansion co-efficiencies of the various materials. For instance plastics expand 8 to 10 times more than glass. For more expansion co-eff-iciencies see Table 1.

In the right column of table 1 the extraction/contraction of material is listed. These values account for a length of 1 meter and a temperature difference of 100°C. Using this data the expansion/contraction for specific construction parts can be calculated, allowing for differences in temperature.

EXAMPLE

Based on a concrete slab of 5 meters length, the maximum temperature of which is + 30°C , with a minimum of - 10°C. The difference in temperature is 40°C.

- 1 meter concrete @ 100°C temperature difference = 1,2 mm movement per m^1
- 5 meter concrete @ 100°C temperature difference = 6,0 mm movement per m^1
- 5 meter concrete @ 40°C temperature difference = 2,4 mm movement per m^1

The calculated movement is 2,4 mm. This force will be transferred in the joint. By sealing the joint with an elastic sealant which durably allows maximum 25% deformation, the minimal width of the joint is: (100/25) x 2,4 mm = 9,6 mm.

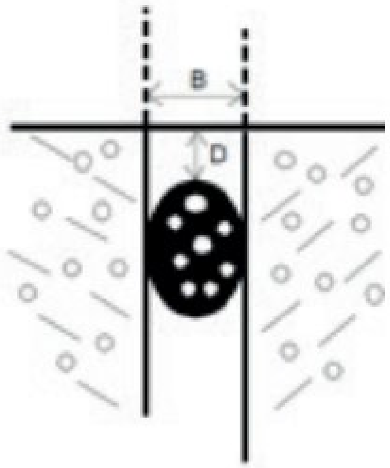
Both the correct width and depth of the joint are important. The depth depends on the width and is calculated by using the formula below.

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 with the correct depth, a backer rod is used (see drawing):



Materials used as backer rods should be weaker that the sealant itself and not obstruct the movement of the sealant, whilst compressing or expanding. Most suitable backer rods are:

- PU Backer rod (open cells)
- PE Backer rod (closed cells)

The rounded shape of the foam creates a good dimension of the joint. Relatively large bonding surface compared to the thinner layer in the middle of the sealant-joint. PU Backer rod is used in non-mechanical joints, or joints unexposed to water (for example façade joints). PE Backer rod is used in mechanical or joints exposed to water. The use of PE Backer rods is more critical than PU Backer rods. Damages to PE Backer rods during application in the joints can release propellant, which can cause blistering in the sealant joint. If air is locked between the rod and the sealant, direct sunlight could cause blisters.

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 is applied to the joint. The polystyrene can be dissolved by the primer.

When the depth of the joint is too small to use a 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 move freely in the joint.

Material	Linear extraction coefficient per °C	Extraction of 1 meter material with a temperature difference of 100°C
Marble	5×10^{-6} mm/m1/°C	0,5 mm
Wood	5×10^{-6} mm/m1/°C	0,5 mm
Brick	7×10^{-6} mm/m1/°C	0,7 mm
Glass	8×10^{-6} mm/m1/°C	0,8 mm
Stone	8×10^{-6} mm/m1/°C	0,8 mm
Concrete	12×10^{-6} mm/m1/°C	1,2 mm
Aerated Concrete	12×10^{-6} mm/m1/°C	1,2 mm
Limestone	12×10^{-6} mm/m1/°C	1,2 mm
Steel	12×10^{-6} mm/m1/°C	1,2 mm
Aluminium	24×10^{-6} mm/m1/°C	2,4 mm
Polyester (fiberglass	30×10^{-6} mm/m1/°C	3,0 mm
reinforced) Polyester	80×10^{-6} mm/m1/°C	8,0 mm
PVC	80×10^{-6} mm/m1/°C	8,0 mm
PMMA (polyacrylate)	80×10^{-6} mm/m1/°C	8,0 mm
Polycarbonate	80×10^{-6} mm/m1/°C	8,0 mm

MORE INFORMATION

If you need more information, please contact your local Bostik Sales Representative.

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