INFORMATION SCRIPT

# Elastic sealants for floor area – Part 1: External

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DEUTSCHE BAUCHEMIE

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## INTRODUCTION

This Information Script explains the application of extrudable sealants for horizontal paved surfaces suitable for pedestrian or vehicular use in external applications.

The particular feature of joints in ground areas is their mechanical loading capacity (working and traffic loads), which applies in addition to the other influences on sealants in outdoor areas. The authors seek to assess the whole range of influences on floor area joints, and to provide guidance for the planning, dimensioning, and structural design, as well as for the selection of suitable sealants. The most important questions are answered with regard to the pertinent standards, as well providing instructions with regard to the processing of sealants, and also in respect of repair and maintenance.

In this context, Part 1 of the Information Script is restricted to the external use of extrudable chemically reactive sealants, without going into greater detail with regard to physically hardening systems (e.g. bitumen) or internal applications. Finally, in Part 2 consideration is given to the issue of “Elastic Sealants for Floor Area”.

# 1 DEFINITION

Joints in external applications are either movement joints or rigid joints. A classic movement joint, apart from joints used in buildings and in civil engineering, is the elastic pavement sealant joint. In this situation, the joint is to be configured in such a way that the paved surface is sealed tight, and, at the same time, the structural components can accommodate movements without any hindrance.

This Information Script accordingly relates exclusively to elastic sealants for floor joints in the sense of movement joints.

Movement joints can in turn be subdivided into expansion joints in the surface, and connection joints, whereby for the former the focus is in most cases on substantial movement and load capacity, and for the latter rather on the connection between different structural components.

As well as the movements which occur, which in most cases are thermally caused, ground joints are often subjected to loadings which are mechanically incurred, such as by traffic (pedestrians or vehicles), or caused by chemicals, such as due to cleaning processes. It is often the case that a combination of mechanical and chemical loading is encountered, such as with joints in car park decks, on the one hand due to vehicle movement and, on the other, due to de-icing salt residue, which comes in contact with the sealant by way of the vehicle wheels.

# 2 REGULATIONS AND FIELDS OF APPLICATION

The following overview summarises the applicable regulations for requirements on sealants, as well as with regard to their use in floor areas.

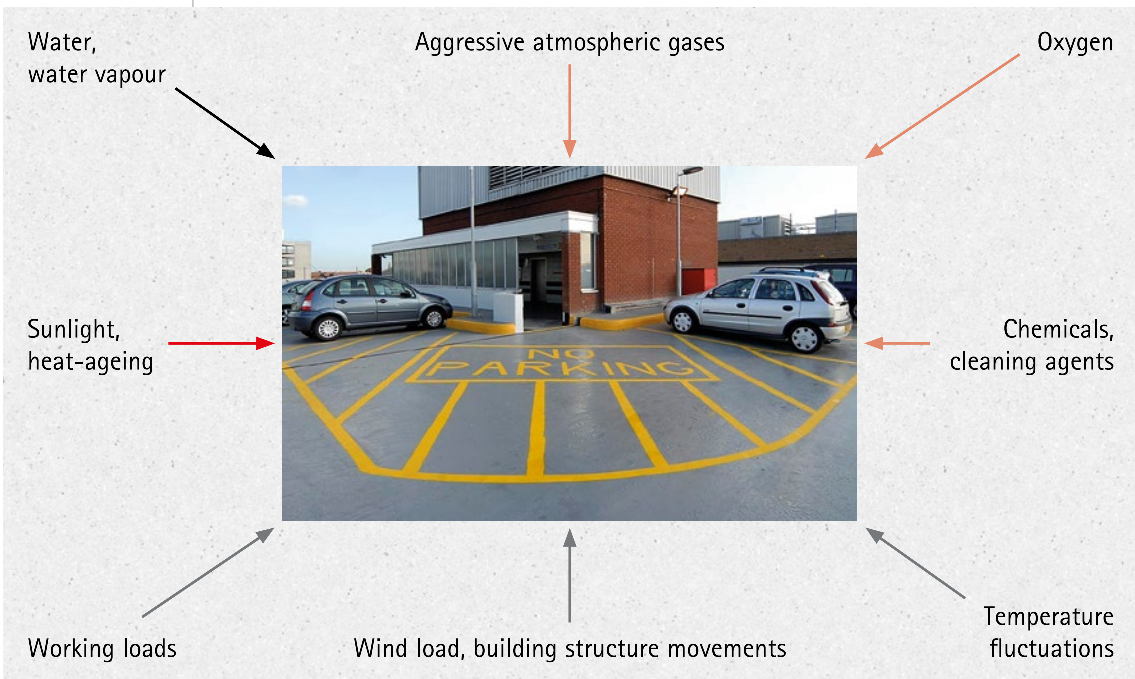
| Relevant standards for requirements for sealants | |
|---|---|
| EN 15651-4 | Sealants for non-structural use in joints in buildings and pedestrian walkways – Part 4: Sealants for pedestrian walkways |
| EN 14188-2 | Joint fillers and sealants – Part 2: Specifications for cold applied sealants<br>Cold-processed joint compounds used for roadways, car park decks, bridge elements, airfields, and other surfaces for traffic use |
| ISO 11618 | Buildings and Civil Engineering Works – Sealants – Classification and requirements for pedestrian walkway sealants |
| CRD-C 526-92<br>SS-S-200E | Federal Specification "Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied for Portland Cement Concrete Pavement" (SS-S-200E) |
| ASTM C 920 | Standard Specification for Elastomeric Joint Sealants |

| Relevant regulations for application | |
|---|---|
| ZTV Fug-StB 15 | Additional technical contractual conditions and guidelines for joints in traffic surfaces |
| DNV Leaflet | Pavings and slab coverings of natural stone for traffic surfaces |
| FGSV | Leaflet relating to suface securing with pavings and slab coverings in bonded format (M FPgeb) |
| WTA Leaflet | Bonded structures – historic paving |
| ZTV Pathways | Additional technical contractual conditions for the construction of pathways and pedestrian areas outside surfaces for vehicular traffic |

# 3 EFFECTS ON SEALANTS

Elastic sealants in external applications are subjected to constant, and constantly changing, effects on the ground surface.

These include:
- Thermal effects (e.g. times of the year and times of day, or artificially induced effects)
- UV and weathering effects (e.g. rain, sun, etc.)
- Vertical pressure forces (deadloads of stationary vehicles, containers, or machines)
- Horizontal thrust forces (parked vehicles on inclined surfaces)
- Horizontal dynamic thrust forces (driving movements, braking, pedestrian traffic)
- Impulse/impact forces (e.g. bouncing and vibrations of machines, driving over uneven sections)
- Abrasion (e.g. cleaning with sliding, wiping/scratching brushes)
- Point loads
- Biological effects (e.g. fungus, bacteria, plant growth)
- Chemical effects (e.g. de-icing salt, waste water, oils and fuels, etc.)
  The effects of chemicals are additionally dependent on:
  - Duration of effect
  - Type and concentration of chemicals
  - Temperature
  - Type and composition of the sealant
  - Material of the joint flanks




*Effects on sealants for floor areas*

Effects on the sealant joint are intensified in the following situations with surfaces which have been in place for very substantial periods of time due to:
- Standing/accumulating water/wastewater, and other media
- Slow drying
- Reduced cleaning possibility
- Increased collection of dirt

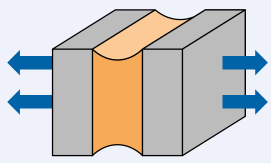
As a consequence of the effects, changes take place in the structural materials/structural components. These are:
- Chemical and physical expansion due to water (swelling)
- Chemical and physical shrinkage due to the release of water (drying)
- Deformation due to loading and removal of loading
- Deformation due to drying

In addition to this, structurally-induced effects incur movements/changes of state:
- Changes of material
- Changes in structural design
- Changes in geometry
- Settlement due to deadweight and pressure of static loads
- For external ground surfaces, lifting and sinking because of frost and thawing

All the parameters referred to can influence the sealant, alone and/or superimposed and cumulatively. This means that adequate joint dimensioning is essential, adjusted and adapted to the structural materials and structural components.

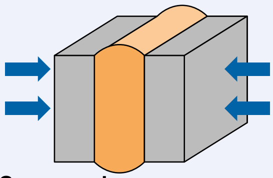
**Physical loads**

As a rule, physical loads imposed on a ground covering lead to movements in the sealant.



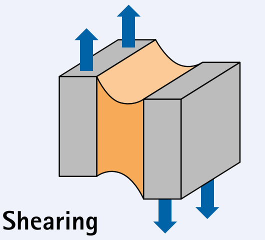
Expansion

If a building material or component **shrinks,** the sealant will be expanded. In this situation, it tapers in its cross-section. This can lead to
- Tearing out the adhesive surfaces
- The adhesive surfaces tearing off
- Tearing of the expansion joint.



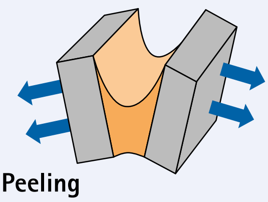
Compression

If a building material or component **expands,** then shrinkage occurs in the sealant. It is compressed. Substantial shrinkage can lead to the "bursting" of the sealant.
As a further consequence, compressive stresses are induced into the subsoil, which can cause fractures in the edge area of the components.



Shearing

If a component **settles** uniformly, the sealant will be subjected to shearing. In this situation the adhesive surfaces are displaced parallel to one another, and the same patterns of damage occur as described for expansion, although with shear loading the damage occurs substantially earlier.



Peeling

If the adhesive surfaces or structural components **tilt** in trapezoidal form apart from one another, what is referred to as peeling loading is imposed on the sealant. With this form of loading, the damage occurs considerably earlier than with the types referred to above.

In floor joints mechanically-induced component movements, vibrations, settlement, etc. must be additionally adsorbed. It is only from this that the minimum joint width can be calculated (see Section 5).

With in-situ concrete surfaces, the age of the concrete (shrinkage) is to be considered. With concrete, the shrinkage which is to be anticipated is to be taken into account in the dimensioning of the movement joint.

**Special influences**
Joints which are subjected to mechanical and chemical loads simultaneously in storage, filling, and transfer systems and manufacturing, handling, and usage installations are subject to the Water Resources Law (WHG), as a result of which the parties carrying out the processing must be certified specialist concerns. This specialist certification procedure is carried out by way of training and examination by an expert organization, as well as by a subsequent monitoring agreement with an expert organization. As well as this, instruction must be provided by the manufacturer with regard to the proper processing of the joint sealant concerned. The sealants additionally require an approval from the Deutsches Institut für Bautechnik (DIBt – German Institute for Construction Technology).

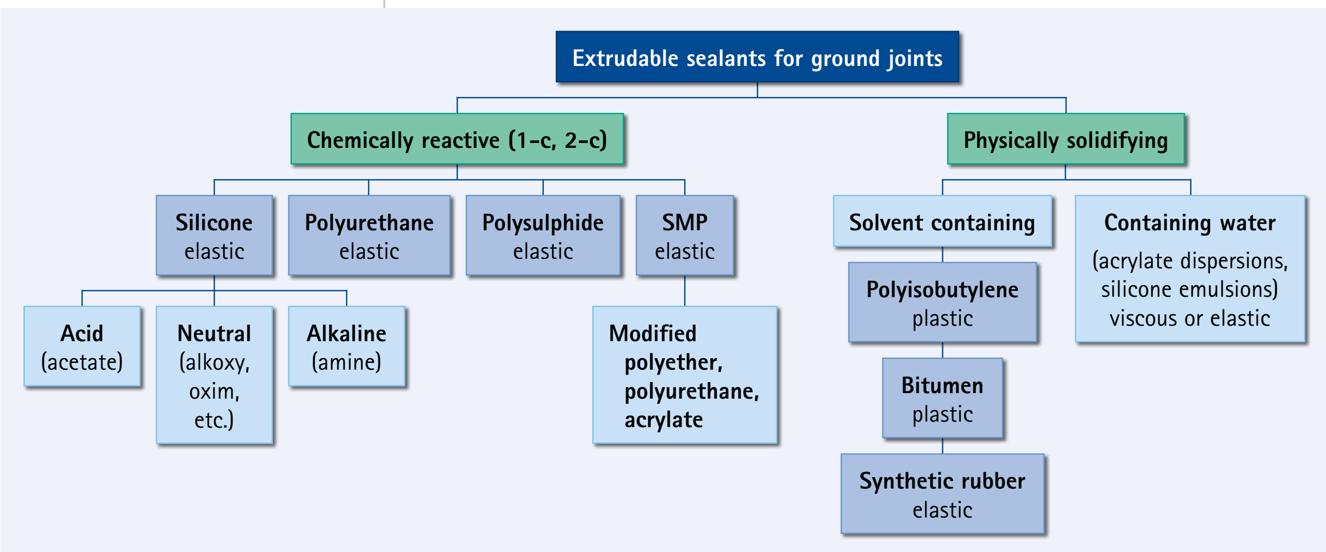
A classic example of a storage, filling, and transfer system is, for example, a filling station, with the chemical substances divided in water pollutant classes 1 to 3.

Since August 2017, systems for handling liquid manure, slurry, and silage effluent, and biogas systems are also deemed to be "generally harmful to water", as a result of which, here too, only such construction products, and therefore also joint sealant substances, can be used which have the appropriate approval from the construction supervisory authorities (abZ) or general construction type approval (abG), and the parties carrying out the processing must be specialist concerns qualified in accordance with WHG.

In principle, the loading in the case of the classic storage, filling, and transfer system occurs only briefly, in the event of an accident, while with systems for handling liquid manure, slurry, and silage, and biogas systems this takes place over a longer period of time, such as during the fermentation process, and due to the silage effluent taking effect on the joint in the mobile silo.

## 4 REQUIREMENTS FOR SEALANTS

Extrudable sealants are typical process plant substances which only develop their mechanical strength by way of a physical or chemical bonding process after the processing. Exceptions to this are sealants with long-term thermoplastic properties (no setting reaction), such as polyisobutylene (butyl).




*Division according to hardening behaviour and raw material base*

**With 1-component chemically reactive systems,** after the removal of the compound from the container (cartridge, sausage, drum), with the ingress of air humidity, chemical reactions take place, which lead to crosslinking (curing) of the plastic sealant compound to form an elastomer (rubber type). These predominantly involve condensation reactions, with which, depending on the crosslinking system, different substances (by-products) are released (e.g. carbon dioxide, water, alcohols, acetic acid, oxim, etc.). The speed of the reaction depends on the temperature (surroundings, material) and the amount of water vapour in the air. Booster systems represent a special case (addition of water in the process). The higher the ambient temperature, the faster a chemical reaction takes place. The reaction takes place from the outside inwards, and begins with the formation of a skin. Cold air contains less moisture, and warm air the opposite, which in each case have a direct effect on the reaction time (e.g. skin formation). Accordingly, in summer the sealant must be smoothed substantially faster before the onset of the skin formation (manufacturer's instructions).

**With 2-component chemically reactive systems,** the crosslinking only starts after the mixing of the two components (base + hardener). Static or dynamic mixers are used for cartridge systems as well as for pumping and dosing equipment. The reaction takes place regardless of the prevailing air humidity, but is likewise influenced by the ambient temperature and the material temperature. It takes place simultaneously over the entire material compound, without identifiable skin formation. The tooling of the material surface must be carried out within the working time left (manufacturer's instructions).

**Physically solidifying sealants** change only physically, for example by hardening during cooling or due to loss of solvents or water. No chemical reactions at all take place inside the sealant or between the sealant and substrate.

The advantage of 1-component floor joint sealants is that no effort is incurred for mixing, and also no risk of mixing errors. The curing is dependent on humidity and temperature. The advantage of 2-component floor joint sealants is the homogeneous and more rapid curing, regardless of the air humidity. The reaction takes place due to the mixing of A and B components.
In ground joints, fairly small instances of damage can occur rapidly on the sealant surface, and accordingly this calls for very good resistance to further tearing. The value for further tear resistance capacity can be drawn upon, *inter alia,* as an indicator of the mechanical loading capacity.
The chemical load capacity principally depends on the respective formulation of the sealant, but there are nevertheless tendencies which are incurred depending on the chemical base.

**Essential properties of selected sealant groups**
Derived from the *Effects on Sealants* described in Section 3 are the *Requirements for Sealants* for the specific areas of application. This is of decisive significance for the *Selection of Suitable Sealants* described in Section 6.

Discussed below are the essential properties of chemically reactive extrudable sealants which can be used for ground joints in external areas.

- Silicone sealants
  Silicones are characterized by excellently good UV stability, have a water-repellent (hydrophobic) surface, and adhere very well to different substrates such as glass, ceramics, concrete, natural stone, metal, and plastics with polar surfaces. They retain their mechanical properties (strength, expansibility, and resiliency) over a wide temperature range almost constantly (-60 °C to +150 °C).
  Silicone sealants without organic plasticizers/solvents can tolerate temperatures of up to 220 °C without sustaining damage, and some special silicone sealants can even go up to 350 °C, as a result of which they can be classified as fire-retardant (behaviour

in fire). The hydrophobic silicone surface does not offer any point of adhesion for organic materials (fungus, bacteria, paints, lacquers, etc.). Released during the curing of silicones, depending on the crosslinking agent type, are alcohols (neutral), oxims (neutral), acetic acid (acidic), or amines (alkaline). This needs to be taken into account as a matter of urgency in the selection of the sealant. Depending on the crosslinking agent type, additional protective measures are to be respected during processing and curing (personal protective equipment, ventilation). After curing, silicones are chemically and biologically inert.

- Polyurethane sealants (PU)
  Polyurethanes have a similarly good adherence profile to silicones in relation to the most widely differing substrates, as well as providing a good adherence surface for paints and lacquers (overpaintability). The group of polyurethane sealants are characterized by wide variety in respect of their mechanical properties and excellent processing compatibility. The service temperature lies between -40 °C and approximately 130 °C, which makes PU very well suited for external applications. With regard to surfaces for traffic use, PU's are characterized by excellent resistance to further tearing. The curing of polyurethanes is a polyaddition reaction of polyols with polyisocyanates. Processing accordingly requires appropriately trained personnel. Depending on the product, it may also be necessary for additional protective measures to be respected. After curing, polyurethanes are chemically and biologically inert.

- Silane-modified polymer sealants (SMP)
  SMP are frequently also referred to as hybrid polymers, since, like silicone sealants, they cure neutrally after releasing of alcohol. These are polyether-based organic polymers. They are additionally characterized by good UV stability, their excellent adherence properties, and good overpaintability. After curing, SMP are chemically and biologically inert.

- Polysulphide sealants
  Polysulphides are the classics among sealants and are obtainable almost exclusively as 2-component products. They are characterized by a high resistance to fuels and to cold. This makes them particularly well qualified for the sealing of pavement joints at fuel stations, as well as other areas subjected to mineral oil and fuels. Polysulphides are also paintable in a similar way to polyurethanes or SMP. After curing polysulphides are chemically and biologically inert.

*Hollow cord (PE closed cell)*

**Backfill material for joint sealants**
As a rule, an elastic material with a non-polar surface is selected as backfilling material respectively backer rod or bond breaker, which in form and dimensions limit the depth of the joint and can prevent the adherence of the sealant to the base of the joint. The sealant should not normally build up any adherence to the backfill material. The measurements of the backer rod are based on the existing joint dimensions.

The following materials are well-suited for backfilling of sealing joints for extrudable sealants:

| Type of material | Form | Properties | Additional properties, notes |
|---|---|---|---|
| Polyethylene foam, closed cell | Round cord, hollow cord, rectangular profile, special profile | Chemically inert, low weight by volume, easy to cut, smooth water-repelling surface, does not convey water (capillary effect), rot resistant, UV-stable | Ideal for all types of sealants |
| Foam rubber, largely closed cell | Round cord, hollow cord, rectangular profile, special profile, plates and shaped parts | Made of synthetic rubbers (CR, SBR, EPDM, HNBR, VMQ, FPM), chemical compatibility with sealants limited | Available in different weights by volume, frequently configured with rectangular cross-sections, adherent on one side or both sides |

# 5 PLANNING/DIMENSIONING/STRUCTURAL DESIGN

Fastened external surfaces are made of the most widely differing structural materials on the basis of their later use, but also for reasons of design. Preference is for materials of concrete, natural stone, or ceramics (clinker among others). Concrete is used in this context in the most widely varied forms. This can be laid as *in-situ* concrete, in order to create an open area (airfield) or a road (motorway construction) over large surfaces, as a flat even space, and without any joints.

Concrete is also popular for use in producing paving stones (concrete products) in a wide range of forms and colouring, in order, for example, to design private areas. These paving stones are laid in a wide variety of structural forms.

This applies likewise to paving stones and slabs which are made of natural stone. In the past, paving stones were usually laid offset in a bed of chippings. In this situation, the joints were filled with sand or split (fine crushed stone). Due to the high traffic loads (heavy goods vehicles and buses) and modern cleaning machines (brush and suction machines), the non-bonded structural form has been subject to criticism for some decades. As a result of this, the laying of paving stones and slabs in a bed of mortar with a bonded joint has become established, and is increasingly preferred due to its easy upkeep.

However, since the tied construction causes rigid endless surfaces to be formed, these need to be interrupted by movement joints. Due to the material-specific coefficients of expansion, changes of temperature require the construction of a surface in the external area. Added to this are stresses due to the setting and drying process of the layers of mortar, stone, and concrete.

The adding stresses on large surface areas, as well as on endless structures such as road-ways and gullies, must not be overlooked. The accumulation of stresses is to be avoided.

The component movements resulting from the temperature fluctuations are the basis for the joint dimensioning.

| Scope of application | Temperature range* | Temperature Diff. (ΔT) |
|---|---|---|
| Exterior | -20 °C to +60 °C | +80 °C |

*Surface temperature

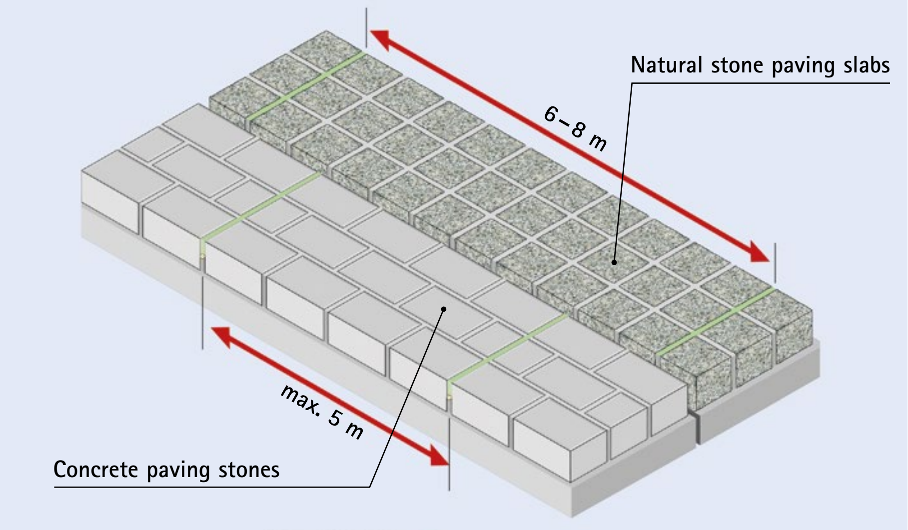
The calculable temperature-related component movements only cover a part of the joint movements.

Surface structures and endless structures are therefore to be divided into individual surface areas by means of expansion joints. Each area can dissipate its stress by way of the expansion joint, which then allows for more substantial damage and defects (torn slabs, broken stones, etc.) to be avoided.

**Distance intervals between expansion joints**
When determining the distance of the expansion joints, the material of the ground covering is to be taken into account.

Concrete has a coefficient of expansion (at 20 °C) of approximately 0.011 – 0.015 mm/m K; conversely, natural stone has a coefficient of expansion (at 20 °C) of approximately 0.006 – 0.008 mm/m K.

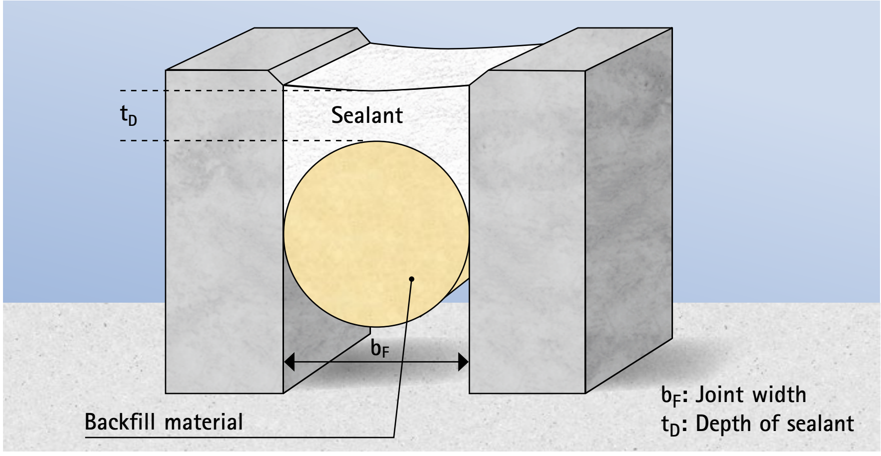
Added to that is the fact that concrete, due to water release (drying) and water absorption, has to a certain extent a life of its own when it comes to swelling and shrinking. Due to this, it is recommended that with concrete structures movement joints be planned in with a distance interval of 5 metres, and with natural stone a distance interval of 6 – 8 metres.




*Movement joint distance intervals*

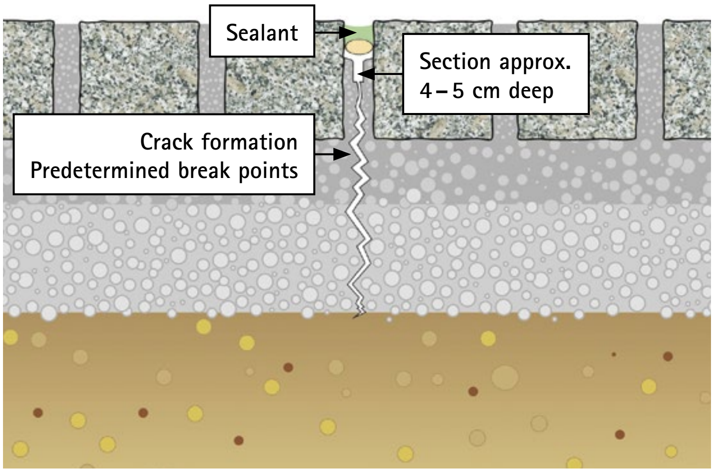
**Producing the movement joint**
Two variants of movement joints have become established on construction sites:

1. If a flat structural component is produced with concrete, the movement joints are then planned in and specified by way of the concreting sections. A soft construction material is introduced into the joint, in order that, during the concreting process, the joint does not fill up, and remains functional. The joint is also bevelled accordingly at its edges.




The sealant accordingly lies somewhat lower, and is therefore not permanently subjected to direct loading.

2. In roadway construction (concrete or paving) a popular approach is to produce an endless structure in one working cycle. The movement joints or predetermined break points are cut into the carriage way or road some hours to days later. This has the advantage that the actual production process does not need to be interrupted, in particular with paving construction which can be adjusted to visual appearance intentions. Added to this is the fact that movement joints produced in this way in paving construction are particularly robust, because in the lower part of the joint the abutment of the stone remains retained. This accordingly avoids the wobbling of the stone during braking or acceleration procedures.




*The expansion joint/predetermined break point cut in subsequently is filled with a sealant. This means that the abutment is retained.*

*Cutting a movement joint into the road covering some days after the laying and jointing process.*

The introduction of the sealant into the movement joint is carried out in the usual manner:

- Clean any substances which would impair adhesion away from the flanks
- Insert a backfill cord
- Apply primer to the adherence surfaces if necessary
- Introduce the sealant
- Smooth the sealant

In principle, joints should if possible be planned for places at which no permanent chemical or mechanical loading occurs.
Mechanically loaded ground joints must be planned differently from the outset, depending on whether the joints involved are to be walked on or driven on by vehicles. In order to avoid the risk of stumbling for pedestrians, joints which are to be walked on are filled up to the upper edge with the joint sealant. With joints which are to be driven on, it can be a good idea for the joint flanks to be ground down, in order to avoid direct contact between vehicle tyres and sealant.

Larger floor joints, which might if necessary be appreciably more than 20 mm wide, should be avoided, or, if possible, be protected by additional precautionary measures, depending on the loading, such as, for example, cover plates, in order to avoid an excessively large attack surface for potential mechanical damage.
In addition, what are referred to as cross-joints often occur in the ground, and, in this case, when calculating the joint, 1.5 times the joint width should be adopted. With a cross-joint, two joints intersect at a right angle, as a result of which the loading incurred at this point is multidimensional, and is therefore particularly high.

# 6 SELECTION OF SUITABLE SEALANTS

The table below provides a simplified overview of the special requirements for elastic sealants and their relevance for the sealing of floor joints in exterior areas for different, exemplarily named areas of application.

In this situation, in this present Information Script consideration is given exclusively to extrudable sealants and not to joint strips.

The fundamental suitability of the products used in a sealing system must always be compared in advance with the recommendations of the sealant manufacturer or clarified separately.

| Special requirements for elastic sealant for floor joints | Applications (examples) | | | | | |
|---|---|---|---|---|---|---|
| | Roadways | Footpaths and pedestrian areas | Balcony/ terrace | Multi-story car park/ parking deck | Logistics and production areas | Airfields |
| High movement absorption and high elongation at break and good resetting capacity (temperature fluctuations and weathering) | X | X | X | X (Temperature fluctuations and weathering; vehicular traffic) | X (Traffic of forklifts and pressure loads due to machines) | X |
| High resistance to further tearing (mechanical loading) | X | X (High-pressure cleaning, brush cleaning) | X | X | X | X |
| Particularly resistant to chemical loading | X (Fuel, engine oil, de-icing salt) | X (De-icing salt) | | X (Fuel, engine oil, de-icing salt) | X (Cleaning) | X (Aviation fuel, de-icing media) |
| Good UV stability | X | X | X | X | | X |
| Lower water absorption (no swelling during weathering and imposition of moisture) | X | X | X | X (Moisture caused by tyres and free-standing on the topmost deck) | | X |
| Natural stone compatibility | (X) | (X) | (X) | | | |

(X) = Relevance only to natural stone coverings

# 7 PROCESSING

## 7.1 Preparation (new construction and renovation)

The surfaces must be dry, free of dust and grease, and also free of non-adhering parts (shrinkage cavities, paint residues, rust, etc.), so that the sealant adhere to them. As well as cleaning, some surfaces additionally require preparation with a primer in order for the sealants to be able to adhere. Primers are to be selected as a dependency of the material which is to be combined.

**Renovation: Removal of old sealant**
During renovation, as a first step, the old sealant and the old backer rod are to be entirely removed, without any residue. The removal of the elastic joints is carried out as a rule by a mechanical procedure, such as, for example, with a cutter blade or by means of joint cutters. In the event that, in addition to mechanical aids, chemical removal means are also used to remove the sealant residue, it is to be ensured no chemical residues remain in the joint, and no reactions with underlying layers occur which could impair the adherence of the newly installed sealants. These can influence the curing and therefore the functional performance of the new sealant.

## 7.2 Installation of sealing compounds

**Stability**
Before being provided with a stable sealant, a backer rod (e.g. PE) is to be applied in order to avoid a three-flank adherence. This is to be selected with floor joints in such a way that the depth of the joint corresponds to the width of the joint.

**Self-levelling**
If the inclination of the ground joint is < 3°, then, as well as stable sealants, it is also possible to work with self-running sealing substances, so that a smooth surface is automatically produced.

With self-levelling sealants, the same preconditions apply as with a stable sealant, but the major difference is the processing. While self-levelling sealants can be used in particular in a completely horizontal joint, stable sealants are also applied in joints with corresponding gradients.
A draw-off procedure is not necessary with self-levelling sealants.

## 7.3 Execution instructions

**Joint geometry, e.g. concave sealant surface**
The joint width of expansion joints in the ground area should in general amount to at least 10 mm and maximum 20 mm. The joint depth should be set in an approximate scale of 1:1 to the joint width by way of backfilling of the joints, but should nevertheless be limited to a maximum of 15 mm.

Floor joints which are subject to vehicular movement should be slightly milled or ground in order to protect the edges of concrete and screeding, or provided with edge protection profiles, and the sealant should be applied in depth.

With floor joints which are subjected to pedestrian walking, a flush-surface jointing should be selected, in order to avoid the risk of stumbling and the unwanted collecting of liquids.
Therefore, joints exposed to chemical stress should also be designed like floor joints that are walked on.

The shaping (occurrence of slight hollow grooving) is influenced by the draw-off aid which is used.


## 7.4 Smoothing agents insert

No smoothing agents should be sprayed onto the joints or applied in an uncontrolled manner with a brush onto the sealant and joint edges. In an optimum application, it is recommended that the smoothing tool be wetted with the suitable smoothing agent, and then drawn over the joint.

Use may only be made of a smoothing agent which is suitable for the application in accordance with the manufacturer's recommendation for the provision of floor joints. Usage should, however, be restricted to a minimum. Smoothing agent residues on the sealant surface or the adjacent materials are to be avoided.

If applied by brush, the joint sealant should be wetted specifically, with only a small amount of smoothing agent, and using a clean brush, and the joint sealant should then be drawn off and smoothed with the smoothing tool.

# 8 MAINTENANCE AND REPAIR

## 8.1 Maintenance

After the elastic sealant suitable for the application and the expected load has been selected and professionally installed according to the current rules of technology, it is important to monitor the permanent functionality through regular checks.

Due to the very widely differing physical, mechanical, and chemical loadings which will take effect on the sealant during its service life, damage may be incurred, which could in their turn cause consequential damage.

**Which joints should therefore be provided with maintenance?**
According to DIN 52460, a joint to be provided with maintenance is a joint which is subject to severe chemical and/or physical influences, and of which the sealant must be examined at regular intervals and renewed if necessary in order to avoid consequential damage. These maintenance joints are to be identified to the placers of the order or principals as early as before the beginning of the work, and are to be taken into account in the formulation of the contract.

Since unforeseeable additional stresses of a chemical or mechanical nature can act on the sealant, especially in public spaces, the time period of the development of defects in the joint cannot be specified in advance. In principle, the maintenance of maintenance joints is the responsibility of the building owner, the operator or their representatives and not the responsibility of the contractor. It is therefore recommended that an additional maintenance contract be concluded in accordance with DIN 52460, which clearly governs the maintenance expenditure, the obligations of the principals, and the coverage of costs.

The maintenance intervals are to be determined individually according to the area of application and the loading which is to be anticipated. For specific sectors, such as storage, filling, and transfer systems or systems for handling liquid manure, slurry, and silage effluent, there are already recommendations and specifications in place for inspections and maintenance intervals in the applicable general construction supervisory authority approvals.

By visual assessment of the floor joints and connection joints, any defects incurred can be easily examined:
- Tear-offs in the flank region
- Tear-offs in the sealant
- Instances of damage in the sealant
- Algae formation
- Discolouration
- Abrasion/wear

## 8.2 Repair

If the joint must be repaired, the sealant must first be removed by mechanical means. Chemical cleaners may cause damage to the underlying layers or influence the adherence and crosslinking of the newly introduced sealant, and are therefore overall not to be recommended.

After the complete removal of the old sealant, it is then necessary, taking account of the current rules of the art and taking account of the anticipated effects and loadings, to select and introduce a new sealant.

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* This version of the Standard (year of issue 2012) is determinant for the CE marking of corresponding products, i. e. the version of the corresponding harmonized European Standard notified in the Official Journal of the EU. Conversely, the Standard version EN 1565-1:2017 had no relevance in this respect.

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# EPILOGUE

This Information Script, "Elastic Sealants for floor area – Part 1: External" was prepared by the Working Group 7.6, "Floor Joints" of Deutsche Bauchemie e.V., and discussed and approved by the Expert Committee 7 "Construction Sealants". It serves to provide information for all members and for the technically interested public.

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