

# IVD-Instruction Sheet No. 5

## Issue April 2011

### Sealing with Butyl-Tape

### Properties, Handling, Applications

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## Contents

### Contents

- 1 Scope**
- 2 General Definitions**
- 3 Standards, Instruction Sheets, Regulations**
- 4 Packaging, Dimensions, Range of Products**
- 5 Properties**
  - 5.1 General Properties
  - 5.2 Specific Material Properties
  - 5.3 Reference Notes and Limits of Applicability
- 6 Handling Conditions**
  - 6.1 Pre-treatment
  - 6.2 Work Steps for the Butyl-Tape Application
  - 6.3 Recommendations for the dimensioning
- 7 Ranges of Application**

## 1 Scope

There are neither required standards nor mandatory planning documents or clearly laid out information in other technical regulations regarding butyl tapes or –profiles.

In this revised IVD Instruction Sheet No. 5 the most important characteristics, properties and recommendations for the application of butyl tapes will be described in order to point out the manifold ranges of application, but also the necessary limits of applicability.

The present instruction sheet exclusively covers the use of prefabricated butyl-tapes and -profiles for covering, overlapping and protective sealing tasks at connections, joints, welds, wrappings, apertures and seams as well as extensive repair work.

In addition the instruction sheet shows by examples of use, where and under which conditions the Butyl tapes can be put into practice by defining important quality requirements and by stating technological and constructional product requirements with instructions for the processor.

It is also valid for applications in combination with other sealing systems, provided that there are corresponding applicabilities and manufacturer's recommendations.

The instruction sheet is not valid for sprayable butyl based sealants, hotmelt butyls or plastic butyl based mastics.

The contents of this instruction sheet do not release the processors from assuring themselves of the appropriate applicability of the butyl tapes for their sealing task by own testing or object based inspections.

## 2 General Definitions

Definitions in excess of DIN EN 26927 and DIN 52460.

### 2.1 Butyl-Tapes and -profiles

Butyl tapes/-profiles are moulded, plastic, non-vulcanized, non-reactive and usually self-adhesive sealing materials, which are built in between joint edges or as a cover over joints and do cover joints and areas without hardening.

### 2.2 Butyl

The term „Butyl“ is a colloquial denomination of an entire group of sealants, similar to the group of sealants “Silicone” or “Acrylate”, materially based on a co-polymer of polyisobutene and polyisoprene, loaded with different bulking agents, auxiliary materials and additives.

### 2.3 Butyl rubber (IIR), Isobutene-Isoprene-rubber

This is a network structured or partly network structured co-polymer out of isobutene and a minor portion of isoprene, whereas the addition of isoprene is necessary in order to achieve a possible network structure (vulcanization) of the product.

### 2.4 Pressure sensitive adhesives (PSA) for Butyl-Tapes

PSA's are solvent-borne, non-reactive, film-forming adhesion-promoter (primer), which are applied mainly on absorbent surfaces in between butyl tape and substrate particularly on absorbent surfaces to seal pores and imperfections, and then air-dried sufficiently to manufacturer's instructions.

### 2.5 Primer

Liquid material for surface treatment of bonding surfaces, which is applied prior to the application of the sealing tape / sealant to the substrate, to ensure its adherence.

### 2.6 Lamination

A lamination is a technological process in which a support surface, such as butyl tape, is permanently connected to a film, nonwoven fabric or fabric web and thus a qualitatively different surface characteristic of the carrier substrate is achieved.

### 2.7 Plastic

Property of a sealant/Butyl tape/-profile to not or only slightly re-deform after deformation by pressure or tractive forces.

### 2.8 Self-adhesion

A sealing material is referred to as self-adhesive, if a proper, permanent adhesion is achieved on the intended bonding surfaces without an additional bonding agent (primer).

### 2.9 Core

The rubber-like inner resistance to tractive forces of butyl tapes.

### **2.10 Cold Creep**

So-called „cold creep“ is an expression for the creep, i.e. the irreversible deformation e.g. of a butyl sealant / -band under load (strongly temperature-dependent property).

### **2.11 Tack**

Tack is a term for the immediate bonding of a very sticky designed butyl tape with a position only difficult to correct on the respective substrate surface.

### **2.12 Overlapping Seal**

Area in which materials or components are arranged on top of each other and the required overlapping in the joint area is being assembled by a sealing butyl tape or butyl sealing cord.

### **2.13 Covering Seal**

Seal where strips of self-adhesive butyl tape are applied over joints and butts of components which sealingly cover the joint- and butt-area in specific widths.

### 3 Standards, Instruction Sheets, Regulations

A classification of butyl tapes according to a required standard or test standard currently does not exist in Germany.

For qualitative assessment of the bands generally the manufacturer's instructions must be observed. The manufacturers guarantee the properties, statements and values of their butyl tape products declared in their instruction sheets. Thus the user can compare and select the suitable material for the appropriate application. Here all the requirements and recommendations, especially for the processing of butyl tapes and the adherence to limits of applicability, are to be carefully observed.

The guaranteed properties can be compared and verified if necessary based on the following test standards.

Test	Preferred test method
Mass and volume change	DIN EN ISO 10563
Shore 00 Hardness	DIN 53 505
Compressive strength	DTU 39.4
Compatibility	DIN 52452
Migration of binder	DIN 52453
Resistance to flow	DIN EN 27390
Adhesion and expansion test	DIN 52455
Ignition temperature	DIN 51794
Water vapor permeability	DIN 53612
Thermal conductivity	DIN 53612
Fire behavior	DIN 4102 bzw. DIN EN 13501-1
Determination of elastic recovery	DIN EN 27389

Table 1: Test standards for selected properties

More specific product and application details can also be read in the IVD Instruction Sheet No. 19 "Sealing of Joints and Connections in the Roof Area".

## 4 Packaging, Dimensions, Range of Products

Butyl tapes can be made customized in a very broad range due to using the latest extrusion and calendaring techniques.

Through variable recipes and configurations certain distinguishing characteristics of butyl tapes are obtained, which are characterized both by their emphasis on different specific individual values, shapes and qualities, but on the other hand share many common typical material characteristics.

This opens up very wide-reaching applications such as repairs and throughout the construction, metal, concrete or wood sectors with sophisticated product qualities and size requirements for the Butyl tapes, which can be made and further processed into various forms of products, dimensions and patterns.

Products	Usual Dimensions	Remarks
<b>Flat tape</b>	Thickness from 0,8mm to 30mm Width from 3mm to 500mm	With release film or release paper
<b>Butyl sealing cord</b>	Diameter from 2mm to 80mm	Without core
<b>Butyl sealing cord with core</b> Core material: Polyamide, Rubber, Cotton, Foam	Diameter from 4mm to 20mm	With core
<b>Laminated tapes</b> Lamination material: Aluminium foil in various thicknesses, Aluminium foils, Polyester coated, PP und PE film webs, Knitting fabric of different quality, Crepe foils, Mesh, impregnated paper, Plastic films (PA, PVC, PE, PET)	Thickness from 0,4mm to 3mm Width from 20mm to 600mm	Butyl width only

Table 2: Butyl-Tape products

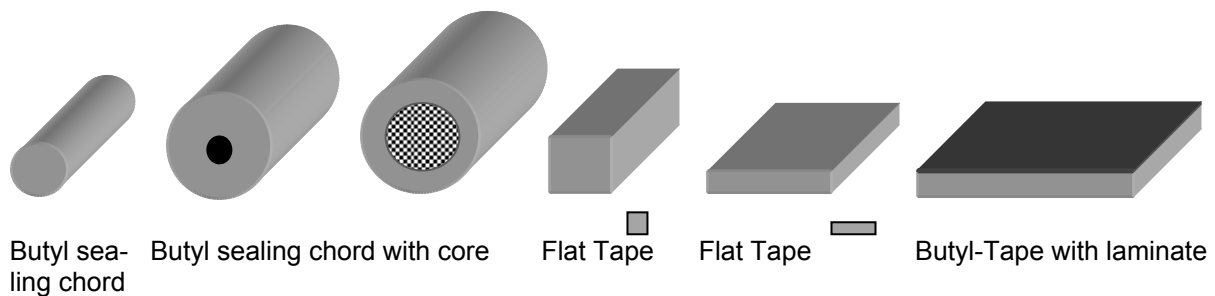


Fig. 1: Different products of Butyl-Tapes/-profiles



These dimensions cover most needs for trade and industry. In addition, the manufacturers offer a wide range of special sizes, including blanks or stampings.

In general, the butyl tapes are wound on cores supplied in multiple or single bobbins. In between the individual winding layers is peelable release paper or release film. Due to this the butyl tapes can be easily unrolled, cut to length, and processed.



## 5 Properties

### 5.1 General Properties

Butyl tapes share a lot of common characteristic features:

Ready to use, non-reactive tapes that do not change their properties over many years

- Many properties of butyl tapes are adjustable from hard and tough to very soft and not sticky to extremely sticky, as well as with the typical plastic features up to slightly distinctive elastic properties
- Extremely low water absorption, thus suitable for corrosion protection and moisture protective seals
- Butyl tapes have a relatively low thermal conductivity, but the conductivity can be increased within limits
- They stand out regarding water vapour non-permeability
- Butyl tapes are physiologically non-hazardous and environmentally friendly
- Self-welding and immediately functional
- Volume consistent, solvent free and almost odourless
- Ageing-, weathering-, ozone- and UV-resistant, impervious to roots
- Under normal storage conditions shelf life for years
- Good attenuation against impact and vibration energy
- Special focus should be placed on the excellent compatibility with metals, concrete, masonry, timber products, glass, u-PVC, polyacrylate, polycarbonate, polyester, plasticizer-free films and with bitumen
- The compatibility of butyl sealants with bitumen or bitumen-containing materials is to be assessed object-based; as there may be in some cases a loss of adhesion of the sealing material, discoloration of the material or on the surface or softening of the butyl material individual tests are required.  
The suitability of butyl seals with bitumen has to be agreed with the manufacturer, unless there are clear recommendations in this regard. In general, butyl tapes and -profiles offer good adhesion on bituminous surfaces.
- Paintable with solvent-free coatings
- Can be plastered over with plaster made to agreed standards and coating thickness
- Chemical-resistant to alkalis, limited to acids
- The temperature behavior is typical thermoplastic, i.e., with increasing temperature there is an increasingly softer material consistency
- Standard butyl tapes comply with the reaction to fire class B2 according to DIN 4102-1
- Butyl tapes reliably seal against radon with sufficient tape thickness
- Butyl tapes do have high electrical insulation properties depending on their composition

### 5.2 Specific Material Properties

Since there can be no generally exact figures regarding specific technical properties due to the multitude of compositions and formulations the following figures can only be given as “from-to”-values for your guidance.

Specific gravity	1,1 bis 1,9	g/cm <sup>3</sup>
Compressive strength	0,02 bis 0,8	N/mm <sup>2</sup>
Shore 00 Hardness	20 bis 80	
Water vapor transmission rate	0,1 bis 0,3	g/m <sup>2</sup> .d
Thermal conductivity	0,18 bis 0,3	W/m.K
Permissible total deformation	4 bis 10	%
Volume resistivity	1012 bis 1015	Ω.cm
Ignition temperature	ca. 440	°C
Solid content	98 bis 100	%

Table 3: Specific material properties of Butyl-Tapes

### 5.3 Reference Notes and Limits of Applicability

In addition to the manufacturer's instructions the following instructions or application limits are to be observed for seals with butyl tape:

- Despite the good temperature stability of about -50°C up to +100°C, however, at extreme temperatures the typical thermoplastic character shows up.
- The built-in plastic butyl tapes may not be permanently exposed to tension and compressive stress, as this will lead to an irreversible deformation of the tapes.
- The resilience of the Butyl tapes only works for a short time, a noticeably faster force reduction occurs and the butyl tapes only absorb little tension upon tensile stress.
- A qualifying examination on plasticizer migration is recommended for sealing on plastics and coatings, as adverse interactions may occur.
- With sealants or adhesives containing aggressive solvents or inappropriate plasticizers stickiness, discolouration and etchings of the tapes may occur.
- Tapes laminated with fleece in exposed weather-dependant applications can be coated over with zinc dust or weatherproof dispersion paint according to manufacturer's recommendations.
- Since the butyl tapes usually are more flexible than paint coatings and plasters, strain can result in cracks in paint and plaster.
- Depending on the recipe setting butyl tapes may have different tack and therefore can be aligned to suit the particular substrate material.
- The development of adhesion to the substrate is purely physical, so if a fast functional strength is required there should be a high surface tackiness (tack) of the tape.

- Butyl tapes with a low surface tack develop a sufficient adhesion only after some hours; this can be improved by strong pressing or rolling onto the substrate.
- A total compression of the tapes must be avoided, therefore, measures for permanent spacing are to be taken.
- For critical bonds in overhead and vertical areas due to cold flow setting an additional mechanical fixing may be required.
- The good tolerance to high-quality sealants enables various combinations with other sealing systems (refer to manufacturer's recommendations).
- Butyl tapes are sensitive to most organic solvents.
- Sharp corners and seams should be rounded off before the tape is applied to prevent a puncture or tearing of the butyl tape.
- Upon cross-transfers in the roof area or in vertical layers the tapes can be lifted from the substrate due to snow-, rain- and ice loads. When this risk pertains an additional edge protection is required.
- Butyl tapes are no fasteners and thus have to be secured to the object by appropriate mechanical and / or design measures.
- Cavities, creases and folds in the butyl tape are to be avoided during installation.
- Joint sealing in the area of roofs and building construction which have to comply with DIN 18540 must not be performed with butyl tapes because of their plastic properties.
- When sealing windows- and door connections to balconies, outside and terrace doors the requirements of DIN 18195 are to be observed.
- In case of subsequent screwing passing butyl tapes the screw holes have to be punched out before with app. 4mm diameter.

## 6 Handling Conditions

Before using Butyl tapes the individual data from the technical data sheets and instructions of the manufacturer have to be taken into account.

### 6.1 Pre-treatment

The bonding surfaces must be dry, load-bearing, dust- and parting agent-free.

They must also be free of surface treatments such as loose paint, sealants, impregnation, porous mortar or polyurethane and polystyrene foam waste, which are affecting the adhesion of butyl tapes.

Depending on the substrate, a cleaning of the bonding surfaces with a cleaner matched to the surface (manufacturer's recommendation) may be required.

Under these conditions, the tapes may be affixed directly to solid and smooth surfaces such as glass, metal, plasticizer-free plastics or varnished wood without primer or bonding emulsion.

Porous surfaces such as porous concrete, concrete, plaster, wood fiber boards, etc. must be pretreated with the designated primers or PSA's according to manufacturer's recommendations. The specified times for air-drying and open times for primers are to be adhered to.

The application temperatures, material temperatures and substrate temperatures should be in the range of +5°C to +40°C.

Comparatively high temperatures facilitate the processing of the tapes due to their thermoplastic nature.

### 6.2 Work Steps for the Butyl-Tape Application

#### 6.2.1 Sealing overlapping building elements with Butyl-Tapes/-profiles

For these sealing solutions usually butyl-sealing chords with or without a core and flat tapes of all shapes and sizes are used.

Cleaning of the bonding surfaces.

For absorbent substrates such as concrete, plaster, porous concrete apply bonding emulsion or primer and let it dry according to the manufacturer's instructions.

Remove release film (-paper) piecewise from butyl sealing chord or butyl flat tape, affix to surface to be sealed and press on.

Cut sealing chord or flat tape to size adding a few centimetres for overlapping/connection points.

Compress to the desired final size, possibly by separate assembly of true to size spacers into the butyl layer (e.g. plastic mesh)

Or use a sealing chord with a suitable core diameter and core material for securing the desired distance.

Fit assembly component neatly over the butyl sealing chord and firmly press together (compensates for imperfections).

Sealing chords can be compressed more easily than flat tapes and therefore are preferred for overlaps (sealing chords have the better output dimension while having the same mass)

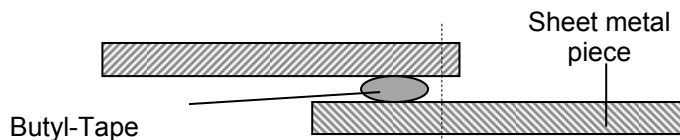


Fig. 2: Example of an overlapping seal using Butyl-Sealing chord (compressed)

### 6.2.2 Covering Seal with Butyl-Tape over Joints, Gaps, Cracks

For these sealing solutions usually surface laminated tapes in different thicknesses and widths are being used laminated with different materials.

- Cleaning of the bonding surfaces
- Application of a PSA for absorbent substrates such as concrete, plaster, porous concrete, air-dry according to the manufacturer's instructions.
- Remove release film (-paper) piecewise from butyl tape and apply over the joint/area to be sealed and press on.
- Bubble-free pressing and rolling of the tape by pressure roller or similar.
- Cut tape to size adding a few centimetre for possible overlaps.
- For horizontal tape seals on inclined surfaces (eg glass roofs) it is recommended to seal up the top of the butyl tape with a suitable gun grade sealing compound.
- Overlaps/seams and intersections are executed object-related, butyl tapes are self-fusing.
- The tapes are stuck in the middle (symmetrical) over the joint (see Figures 3-6)

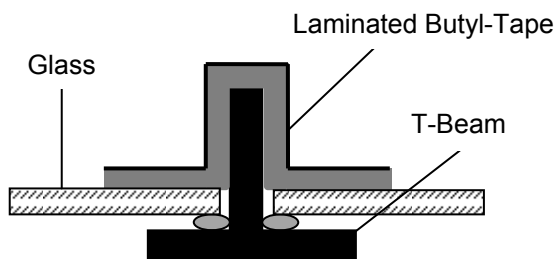


Fig. 3: Example of a covering seal using laminated Butyl-Tape

## 6.3 Recommendations for the dimensioning

For the determination of joint dimensions, when butyl tapes are to be used for sealing, only a 4 per cent to a maximum of 10 % can be taken into account as maximum movement accommodation (IVD). Since butyl tapes, depending on recipe and possibly lamination show a different plastic behavior and only a slight elastic recovery, which in addition is also

very dependent on temperature, pre-calculated joint dimensions are not very suitable for practical applications. Specific calculation requirements or formulas are not known for it.

Depending on the kind and width of the joint (gap) butyl tapes thus are applied either holohedral or in loops respectively with a backing material or a release film onto the substrate surface.

For the width of the butyl tapes as a necessary minimum bonding area, which has to be glued using the entire surface, the following recommendations can be given (Figs. 4 to 7).

For porous and absorbent surfaces such as hardboard, particle board, rough-sawn wood, porous concrete the surface has to be prepared using a primer or adhesive before applying the butyl tape with at least 30mm width on both sides of the joint (gap). The butyl tapes thus should have a high tack, meaning a high surface tack (Fig. 4)

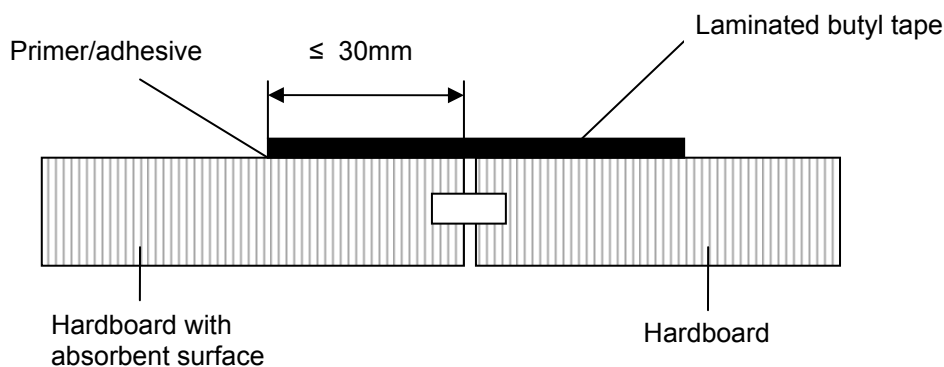


Fig. 4: Recommended minimum width of butyl tapes on absorbent surfaces

For smooth, non-absorbent surfaces such as glass, metals, ceramics, natural stone and some plastics a full-surface glued minimum width of 20mm on both sides of the joint is recommended. The tape can be laid in loops, or using backing material and has to be decided depending on the object (Figs. 5 and 6).

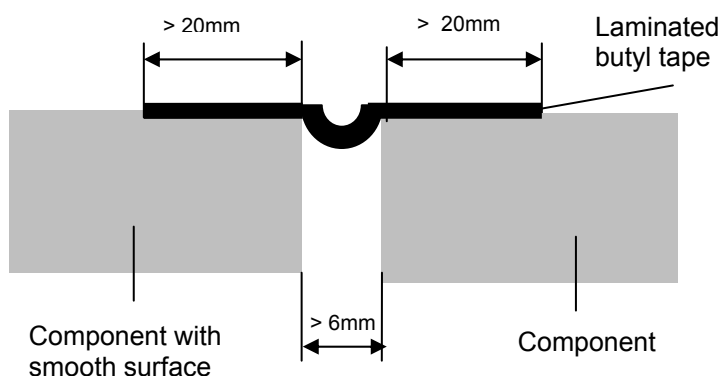


Fig. 5: Recommended minimum width of butyl tapes on smooth surfaces

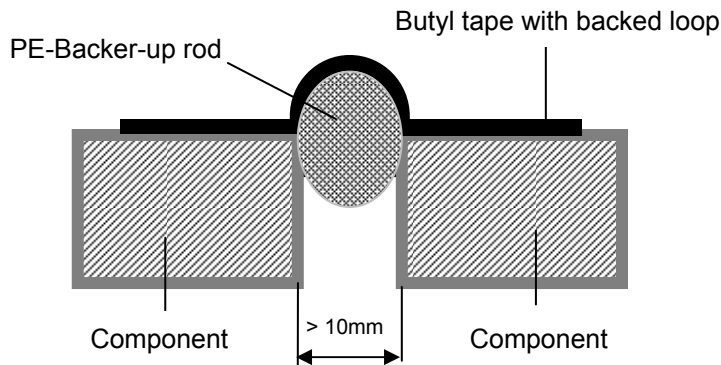


Fig. 6: Butyl tape seal with Backer-up from 10 mm joint width

On inside seals of window perimetre joints executed with butyl tapes the width of the adhesive area should not exceed 60 mm on the window reveal.

Regarding the plastering of the window reveal, however, there must always be considered a sufficiently large plaster-adhesive area of at least 50% of the width of reveal. In case of a narrower reveal width the adhesive areas for the butyl tapes are to be reduced proportionally in order to achieve sufficient plaster adhesion. Adhesive area widths smaller than 20mm for the butyl tape, eg with very narrow width of reveal, must be avoided (Fig. 7).

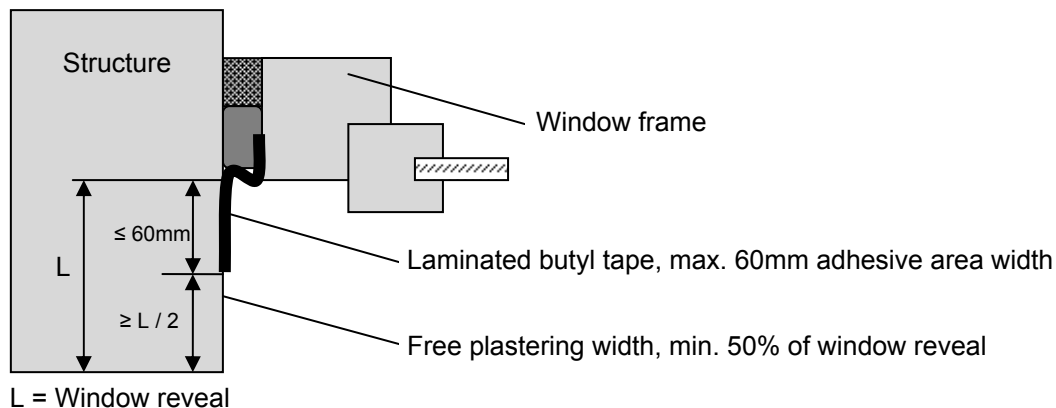


Fig. 7: Sealing of a window (inside) with butyl tape laminated with non-woven fabric, suitable for plastering over

## 7 Ranges of Application

In addition to very universal applications across the construction, industrial and handicraft sector butyl tapes are frequently used in the repair sector or remediation of moisture damage and leaks.

### Examples (representations are not to scale):

Repair or restoration of weathered joints or covers, eg winter gardens and greenhouse construction with laminated butyl flat tapes. Preferably butyl tapes 1 – 2mm thick with variable width and aluminum- or fleece lamination are to be used which can be painted.

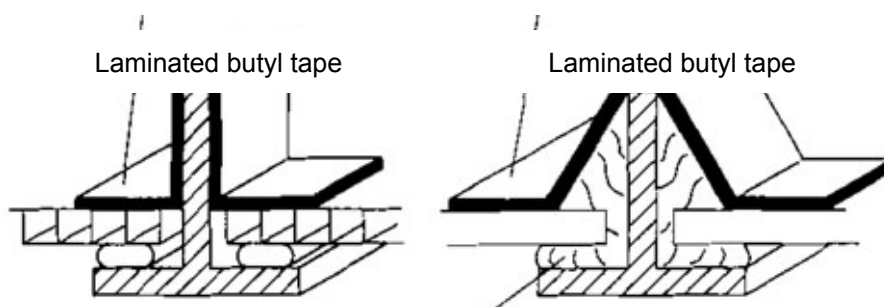


Fig. 8: Butyl tapes for repairs to damaged roofs

Overlapping and masking seals in civil engineering at joints and seams with aluminum-laminated butyl tapes and butyl flat tapes of manholes, sewer parts, inspection chambers, slurry tanks and containers made of concrete.

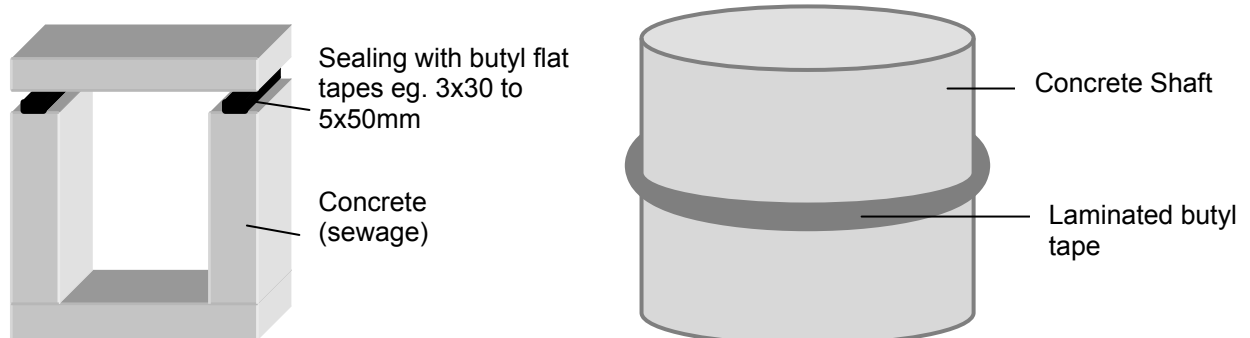


Fig. 9: Butyl flat tapes with and without lamination for seals in shaft construction

Seals in metal construction. All butyl tape variants are suitable, as they for example do not cause corrosion, seal very well, are immediately operational and highly compatible with all metals.



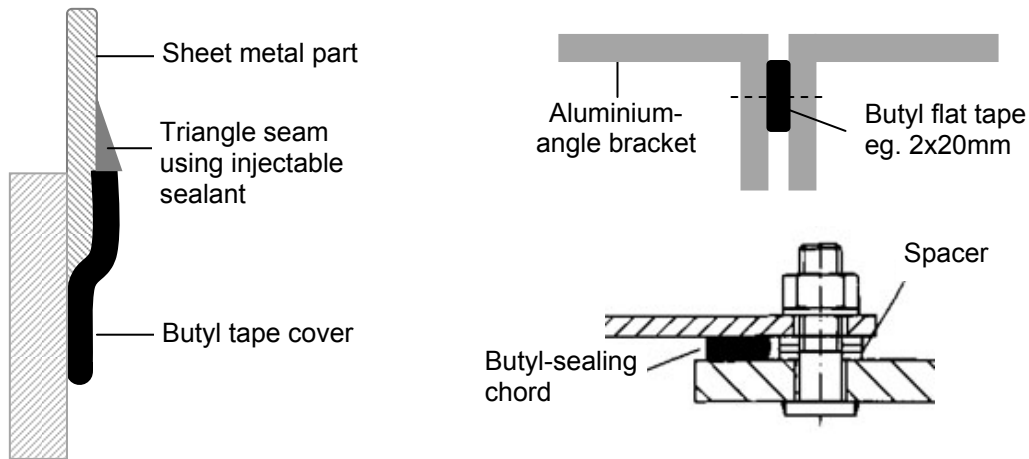


Fig. 10: Examples for seals in metal- and vehicle construction

During the construction of caravans and containers many seams and material overlaps of mounting parts and components as well as necessary seals for strings and trim strips can be found. Butyl tapes serve as an assembly aid due to their good adhesion and laminated tapes as a secure seal.

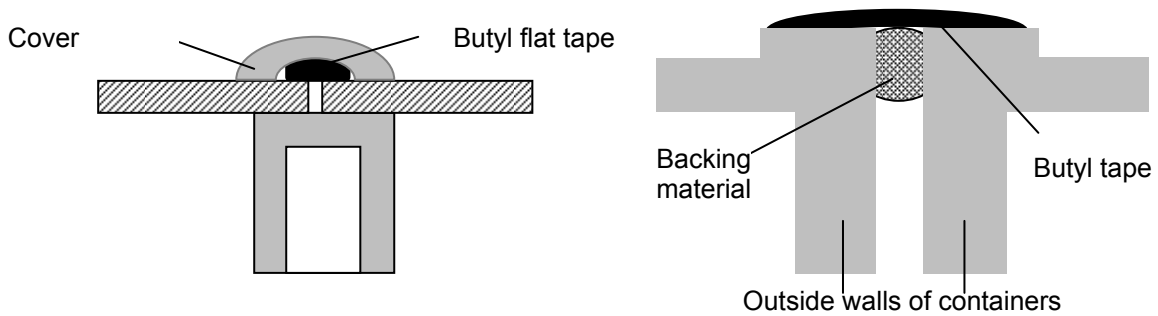


Fig. 11: Butyl tape seals used during construction of caravans and containers

Dome light seal repair with butyl tapes compatible with bitumen, weather- and UV-resistant and paintable butyl tapes. If necessary the upper edges can be sealed additionally with gun grade sealant.

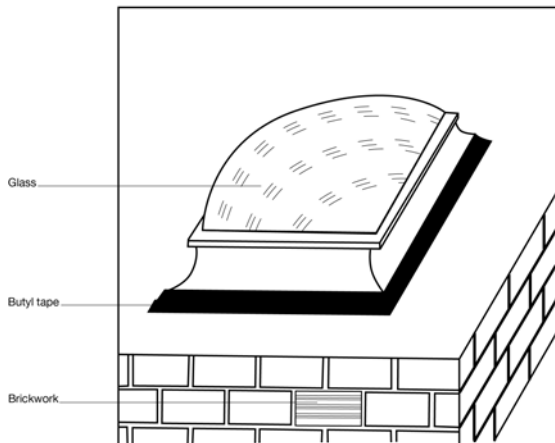


Fig. 12: Repair seal on dome lights with butyl tape

Seals in the roof area, exterior and interior applications.

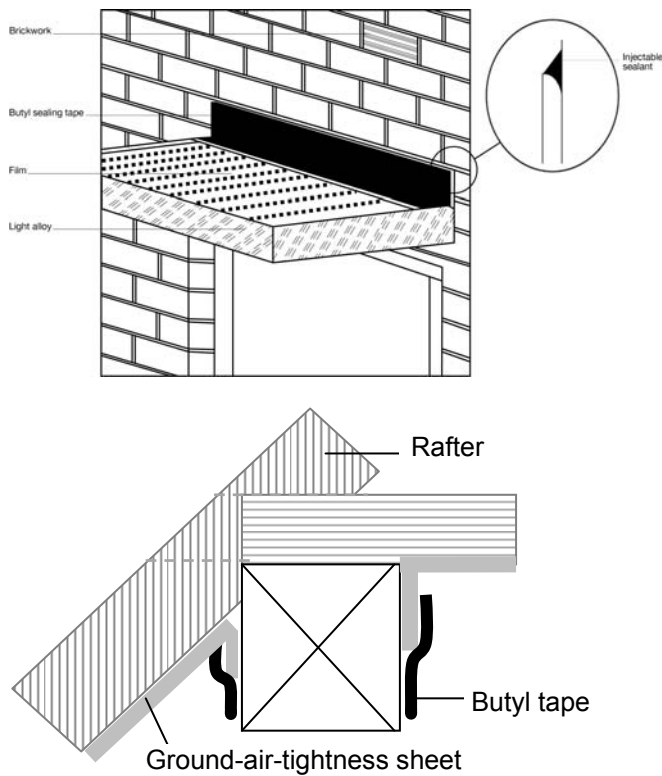


Fig. 13: Seal between awning and wall and seal for ground-air-tightness sheet for roofs (inside)

Seals for ventilation-, air condition- and refrigeration engineering

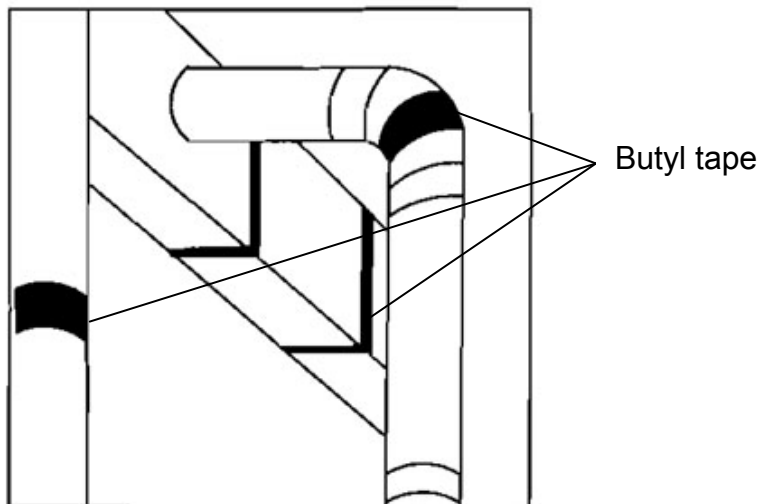


Fig. 14: Seals for butt joints in ventilation engineering

Overlaps and covers of corrugated and trapezoidal roof panels

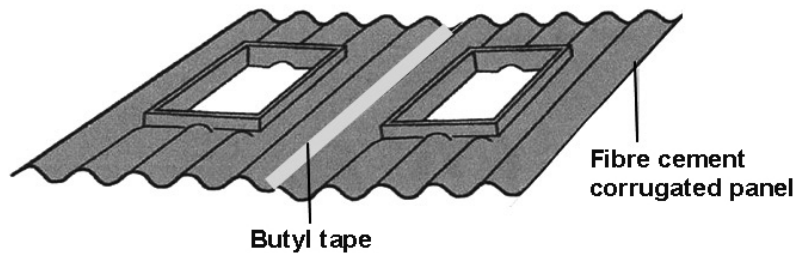


Fig. 15: Overlaps of corrugated panels sealed with laminated butyl tape

Joints on windows and doors on the internal side can be sealed hermetically and diffusion-braking butyl tapes which can be plastered over.

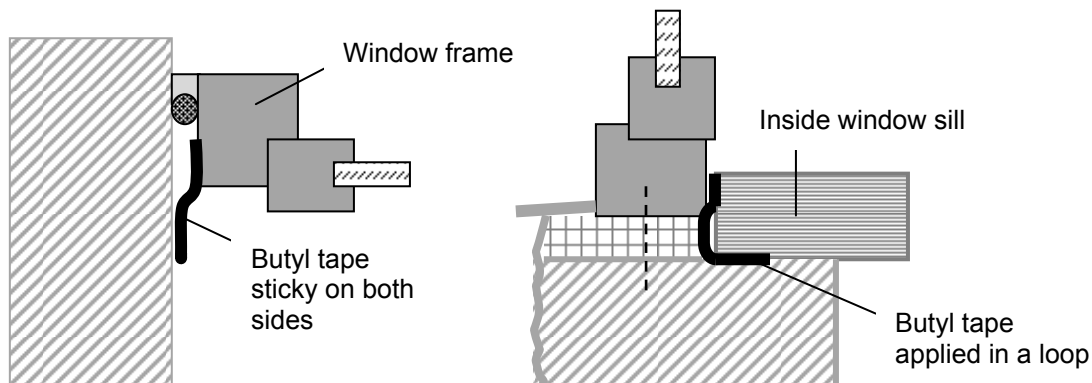


Fig. 16: Inside window perimeter joint with butyl tape

Further applications for laminated butyl tapes, sealing chords and flat tapes:

- Corrosion protection coating for above-ground installations of metallic tubes
- Sealing of riveted and bolted connections in the body and vehicle construction
- Sealing and insulation of bushings at cable entries into cable sleeves
- Roof entries of electricity and telephone cables and antenna masts
- Overlaps and covers in the air conditioning and ventilation technology
- Use as a high-quality primary sealant for multi-panel insulation glass
- Sealing of outdoor sheet metal flashings
- Formwork- and form seals in the precast concrete industry
- Sealing of overlapping parts of housings In the appliance industry
- Assembly seals in the entire automotive industry
- Floor-wall corner joints under tiles in the sanitary field
- Joints in the glass roof with butyl tape and sealant to protect the edges
- Joints in the lightweight construction during installation of sandwich panels
- As a nail sealing tape or under counter lathings in roofing
- Load bearing and sealing adjusting tape in shaft construction
- Sealing tape between light shafts and basement walls
- For joints which need water vapor- and gas-tight properties
- Various applications in Cleanroom Technology

- Durable seals for the achievement of air tightness in buildings

The applications for butyl tapes are enhanced permanently by new applications in practice, and exemplify the very universal and easy to apply sealing material butyl tapes.

For the installer, these are:

- Good adhesion to most materials, no expensive tools and equipment used in handling
- No time-consuming curing, because immediately operational
- The extensive range of butyl tape quality products
- Very significant advantages for their application

**Contributors:**  
**Dr. Karl Ritter**

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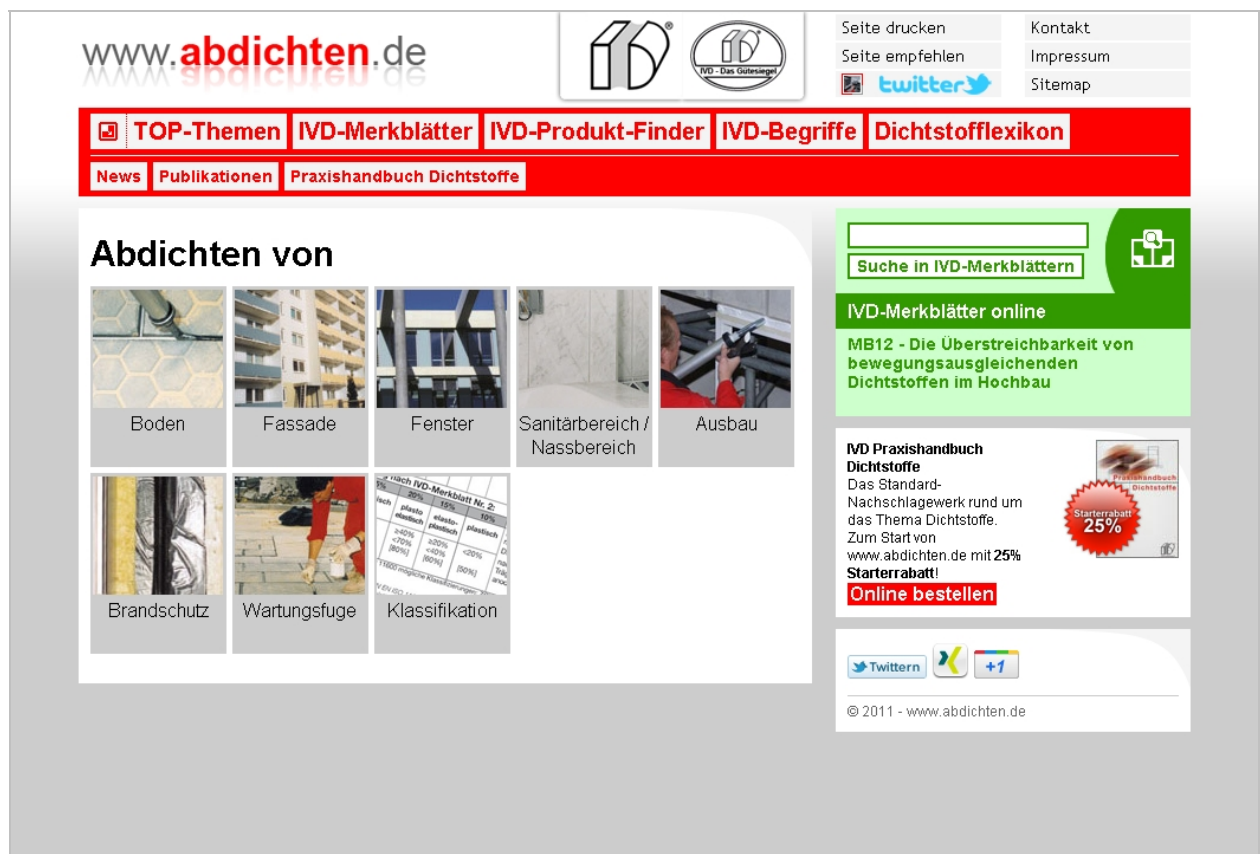
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In addition, **all information** about the **joint-sealing** in the areas of **soil, facade, windows, sanitary and water construction**.

As well as the **IVD term search**, the entire sealant online lexicon and continuously **updated news** about the topic.



The screenshot shows the website interface with a navigation bar, a main content area with a grid of images for 'Abdichten von' (Sealing of) including Boden, Fassade, Fenster, Sanitärbereich / Nassbereich, Ausbau, Brandschutz, and Wartungsfuge. There is also a 'Klassifikation' table. On the right, there are search bars, a 'Suche in IVD-Merkblättern' button, and a promotional banner for 'IVD Praxishandbuch Dichtstoffe' with a 25% discount. Social media icons for Twitter and Facebook are also visible.

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