

# WATERPROOFING OF EXPANSION JOINTS: AN ORIGINAL SYSTEM, SIMPLE AND EFFICIENT

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In all construction, it is essential to provide joints between the component elements. Waterproofing these joints has to be realized with materials and through processes which resist constraints due to movement of the building itself on the one hand and to aging and fatigue on the other.

Waterproof joints are usually made on raised parts of the work to avoid water stagnation on the joint itself (*Figure 1*). In many cases, this is not possible, and one must use a flat or slightly elevated joint.

Traditionally, these joints are realized by packing or by using membranes of different materials. Packing is generally accomplished with plastic or elastoplastic foams. The joint is waterproofed mainly by adhesion of the packing to the two component parts of the joint and by the flexibility of the packing. Joints based on one or many membranes are usually made with different materials such as polyvinyl chloride, polychloroprene, lead or copper sheets or reinforced bitumen. (*Figure 2*).

However, joints waterproofed with plastic or elastoplastic packing often become weak after some time and lose adhesion to the two jointed parts. Moreover, these joints, as joints made with membranes, need long and careful preparation. Furthermore, membrane joints present many problems which are usually difficult to resolve with good reliability. Any crossing or directional change point that needs a special membrane consideration can lead to improvisation and poor quality work. Waterproofing expansion joints remains the most delicate aspect of building. It is essential to attach the greatest importance to these systems and to their application.

The system presented here avoids most of these problems and makes reliable flat waterproof expansion joints easy to apply.

The system includes a joint without a gusset, which can be deformed without much effort, because the soft support gives a permanent independent area (*Figure 3*). It is essentially based on the use of a sheet material, reinforced with a polyester fabric coated with a mass of high elasticity and highly aging resistant elastomeric bitumen. Joint edge preparation is very easy. Application is easy, rapid and reliable. Crossings and direction changes particularly are made easily and reliably.

## CONSTITUTION

The system is based on the use of a sheet material, reinforced with knitted polyester fabric, coated with highly elastic, aging resistant elastomeric bitumen (*Figure 4*).

The middle of the sheet straddles a soft mineral fiber band, 35mm thick and 150mm wide. The two lateral sides of the sheet are fixed on both sides of the joint, over 10 to 12cm wide. Application is easy because of the flexibility of the

material, which can take any shape to provide a waterproof coating over the most complex profile.

The upper face of the sheet has an aluminum band, 200mm wide, 0.02mm thick, permitting the joint protection elements to remain free to move independently.

If a second waterproofing sheet covers the first one, freedom is completed by a fiber glass sheet in such a way that movement in any of the three directions cannot be blocked. In the case of elastomeric bitumen or traditional multilayer coating, the joint sheet is bound with resistant materials, directly or by thermal insulation or wood allowing the adhesion of waterproofing materials.

Suitable protection is provided for any use. The basic principle of this system is to let all the component elements move freely in all directions, without restraint or fatigue. Such a joint allows movement of  $\pm 10$ mm in elongation, compression and shear and  $\pm 20$ mm in differential settling. It may be used on accessible or inaccessible roofs, car parks or garden roofs. Adaptations to all kind of supports have been developed. The system has been used successfully since 1977. There is no doubt of its simplicity and its reliability.

## APPLICATION

Apply the first layer or layers of waterproofing and stop at the edge of the joint. These layers are fully adhered to the support for 25cm minimum on both sides of the joint.

It is possible to apply the first layer continuously over all the surface for temporary waterproofing. This layer should be cut to permit precise location of the joint axis and to assure proper functioning of the whole system.

Center the mineral fibre support band on the joint.

Apply the joint sheet, release paper up, on the support band and torch the sheet carefully on both sides for 10 to 12cm, preferably using a special blowpipe with two burners. After cooling, take off the release paper. Sheets are overlapped 10cm after taking off the aluminium.

Apply the next layer or layers of waterproofing to the edges of the joint sheet. Apply a layer of elastomeric material, about 50cm wide centered on the joint.

To avoid any penetration of dust, sand or rubble, cap the joint sheet with a band, about 1m wide, centered on the joint, torched or adhered on the edges. The nature of the band depends on the performance of the sheets constituting the usual covering.

Apply the specific protection for the case considered.

## SPECIFIC PROTECTIONS

The protection is an integral part of the joint system and depends on the nature and purpose of the waterproof work. We distinguish four main types of protection.

### Decks Not Open to Traffic

This is the simplest case. This type of joint is made when the surface itself is self-protected or protected by gravel and when an elevated joint is not desired. Protection is provided by a band of self-protected membrane applied loose as described above. The membrane is usually composed of polyester fleece reinforcement and elastomeric bitumen for high resistance to fatigue and aging (*Figure 6*). This kind of protection is also used for joints on elevated joints. (*Figure 7*).

### Decks Open to Pedestrians

A flat slab provides protection and harmony with the roof proper. The slabs are set on a row of bricks, or prefabricated slabs are placed on a band of polyester fleece to allow movement of the joint. *Figure 5* shows the two kinds of protection, prefabricated slabs or cement slabs on a sand layer.

### Decks Open to Car Traffic

A shaped slab, specially designed for this use, is set on polyester fleece. We often use two layers of joint sheet separated by an independent membrane to prevent the sheets from sticking together (*Figure 8*).

### Garden Decks

The joint membrane is protected with the same material used for the specific layer. Mechanical protection is achieved by means of slabs set over bricks. Slabs should remain accessible for possible control of the joints. Flat joints should be avoided on garden decks. Elevating the joint is recommended to facilitate the control mentioned above (*Figure 9*).

## CROSSING AND DIRECTION CHANGES

These details, as waterproofing professionals know very well, always raise problems not easy to resolve through classic systems. Some people suggest using prefabricated components, but their application and functioning are often open to criticism. Most people leave the applicator to "manage on his own" with all the risks which may rise.

This waterproofing joint system solves, in a simple, rapid, reliable way, all these difficult problems.

### X and T Joint Crossings (*Figure 10*)

Apply the mineral fiber support band in one direction as if it were not crossing. Apply the other bands in the second direction, until they touch the first band. Torch the joint sheet in one direction and then the other, covering simply the two bands, after taking off the aluminium sheet from the first (*Figures 11, 12 and 13*). Protection for these points is secured according to the same principles used from the current part. Prefabricated crossing pieces have been developed for this purpose.

### Direction Change

The same principle is used (*Figures 14, 15, 16 and 17*).

### Joint Between Horizontal and Vertical Joint

There is no interruption in this case (*Figures 18, 19 and 20*). The vertical part of the joint is protected, as decks not open to traffic, by the self-protected, high-performance membrane.

## FIELDS OF USE

As we said, the possible uses are numerous and varied. We can replace traditional joints with this system in most waterproofing cases.

However, some applications are more interesting than other, notably terraces open to traffic where elevated joints are not possible, or are at least problematic.

The uses are defined, case by case, according to the following parameters:

- Use of the roof: inaccessible, accessible for pedestrian, car park, garden.
- Slope: for inaccessible roof more or less than 5 percent, in other cases, less than 5 percent.
- Roof decks: concrete, cellular concrete, wood, steel.
- Roofing for main areas: conventional built-up roofing, elastomeric bitumen or poured asphalt.
- New construction or reroofing.

For each of these fields of use, there are particular instructions which take into account the specific problems and give the user the reliable solution he expects from the waterproofing contractor.

## ADVANTAGES OF THE SYSTEM

Compared to conventional methods, this system presents many advantages for the architect, the roofing contractor and the owner.

### For the Architect

- A homogeneous solution for waterproofing and protection of waterproofing, which is adaptable to the most difficult cases. This system eliminates two main sources of failure:

No rigid material, such as lead or copper, is used.

No string which may be torn by joint movement and no mastic or packing.

- It can be used over any deck waterproofed by conventional processes, such as BUR, elastomeric bitumen, with or without thermal insulation, on horizontal or vertical surfaces and on poured asphalt waterproofing.

### For the Contractor

- The joint is simple in form. This avoids problems of alignment, regularity, mistakes.
- No difficult-to-realize strings, especially at the level of the membrane covering. No stuffing or mastic.
- Joint crossings need no specific material.
- Execution is rapid and economical.
- Application by torching is made easier by the structure of the joint material.

### For the Owner

This system avoids elevated construction of joints. The usable surface is clear and more aesthetic.

The reliability of the whole system is improved. This eliminates many sources of leaks, always unpleasant and unacceptable in a modern construction.

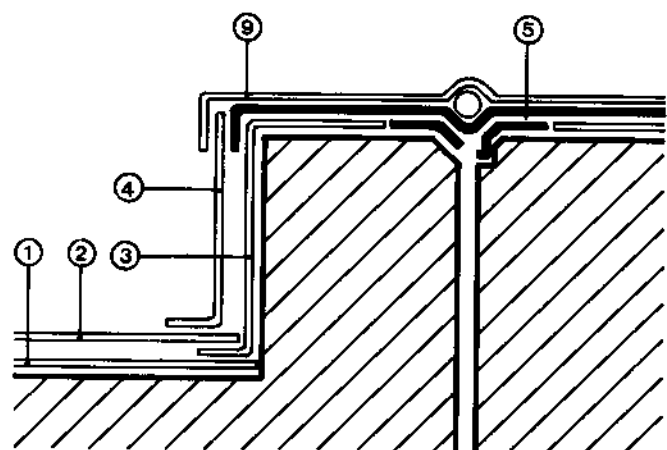


Figure 1

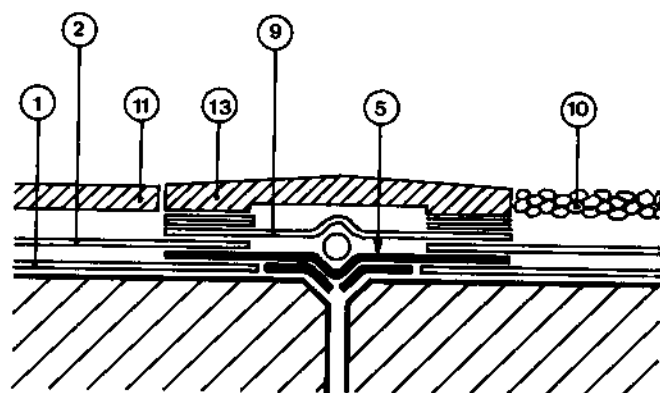


Figure 2

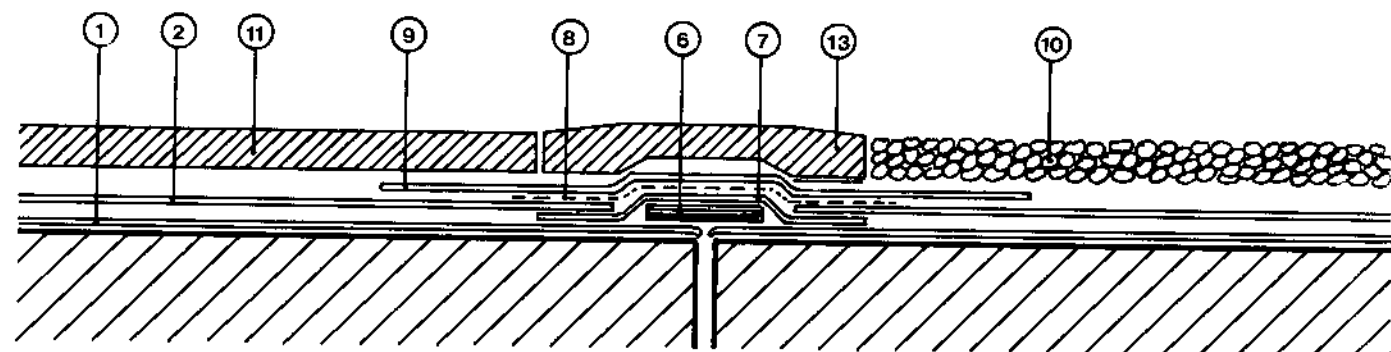


Figure 3

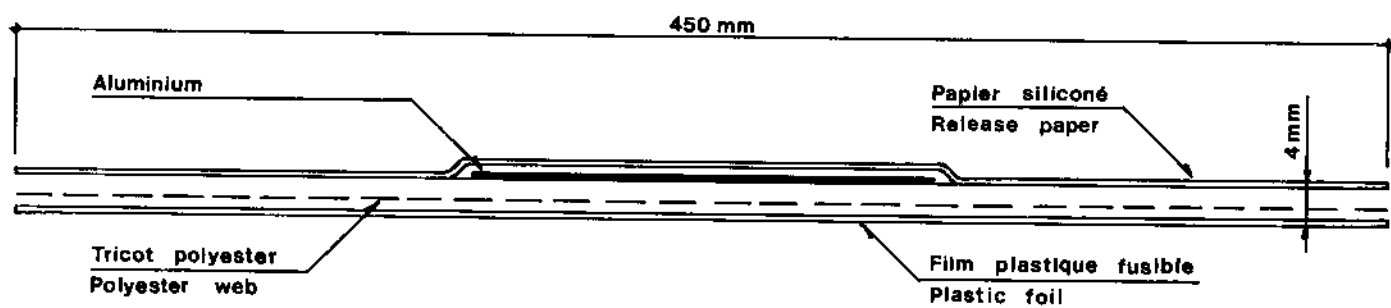


Figure 4

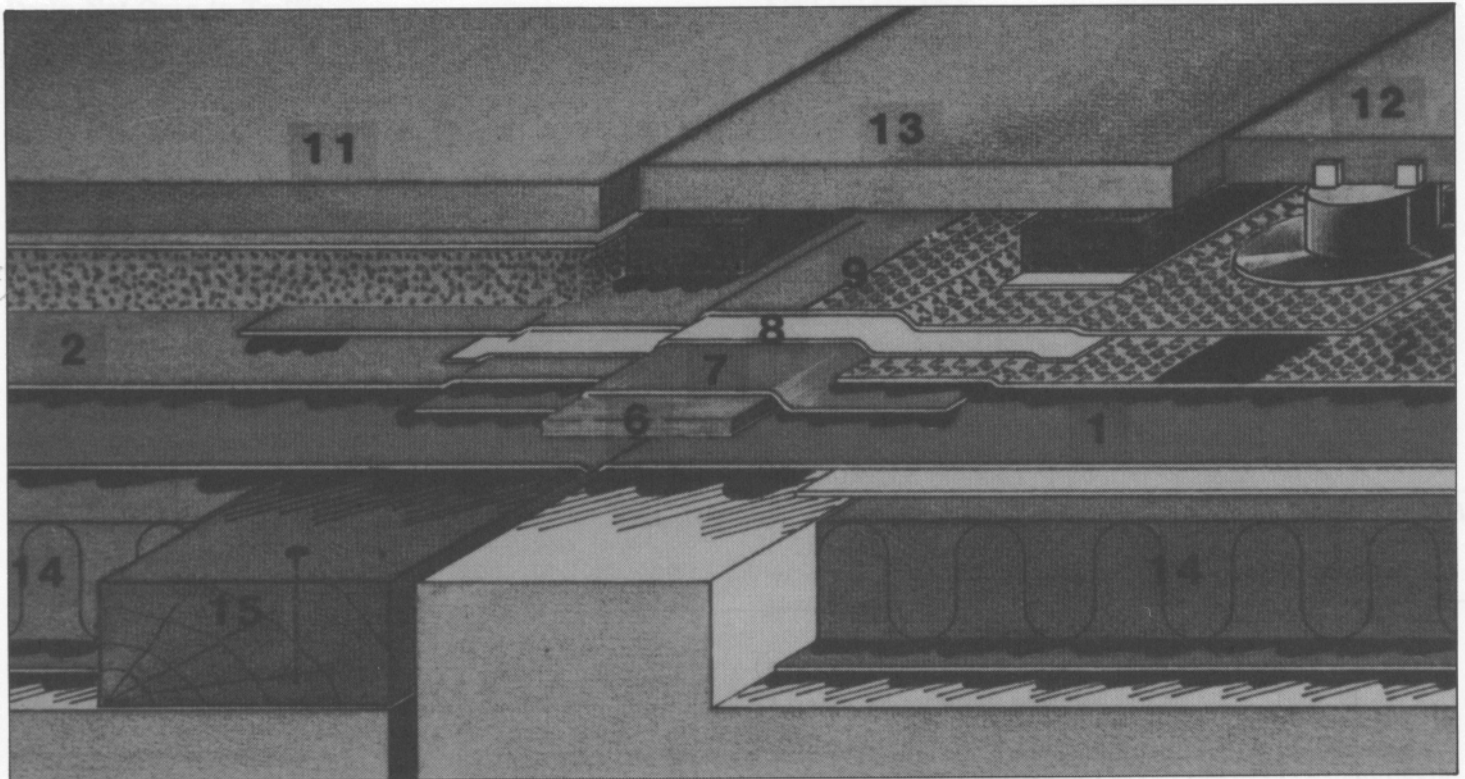


Figure 5

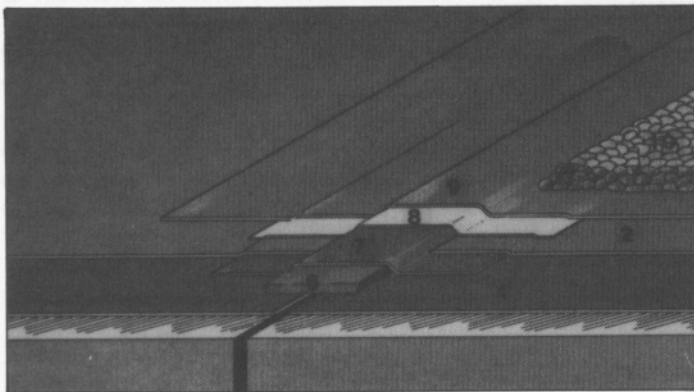


Figure 6

...ing. As the other bands in the second direction, and then back the first band, repeating the pattern and direction and thus the other covering over the two bands, after taking out the aluminum sheet from the first (Figure 11), a small upstanding part of these points is secured according to the substructure used from the current part. Prefabricated crossing pieces have been developed for this purpose.

#### Direction Change

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#### Joint Between Horizontal and Vertical Joint

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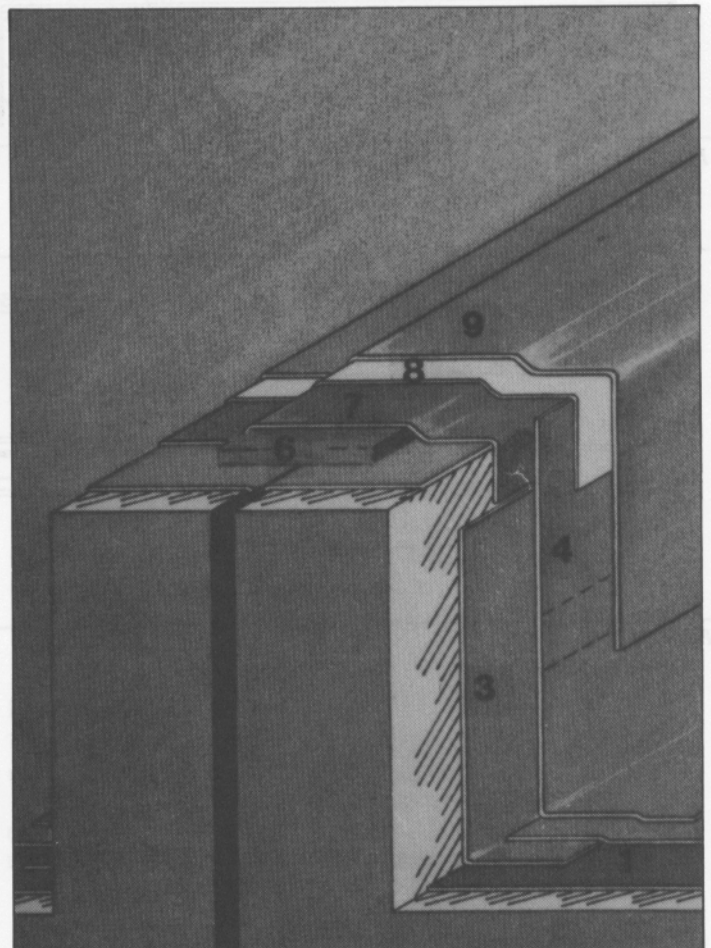


Figure 7



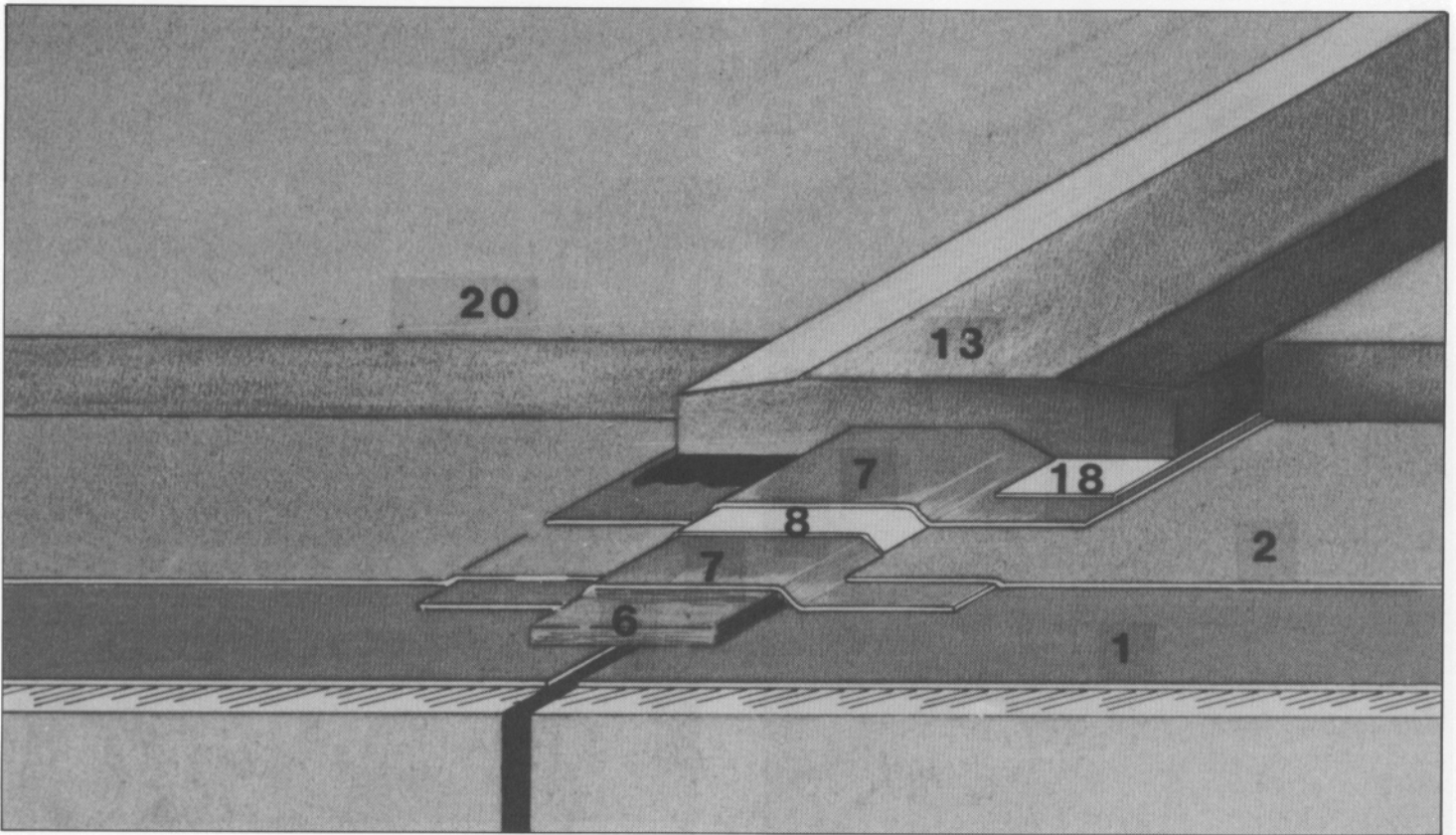


Figure 8

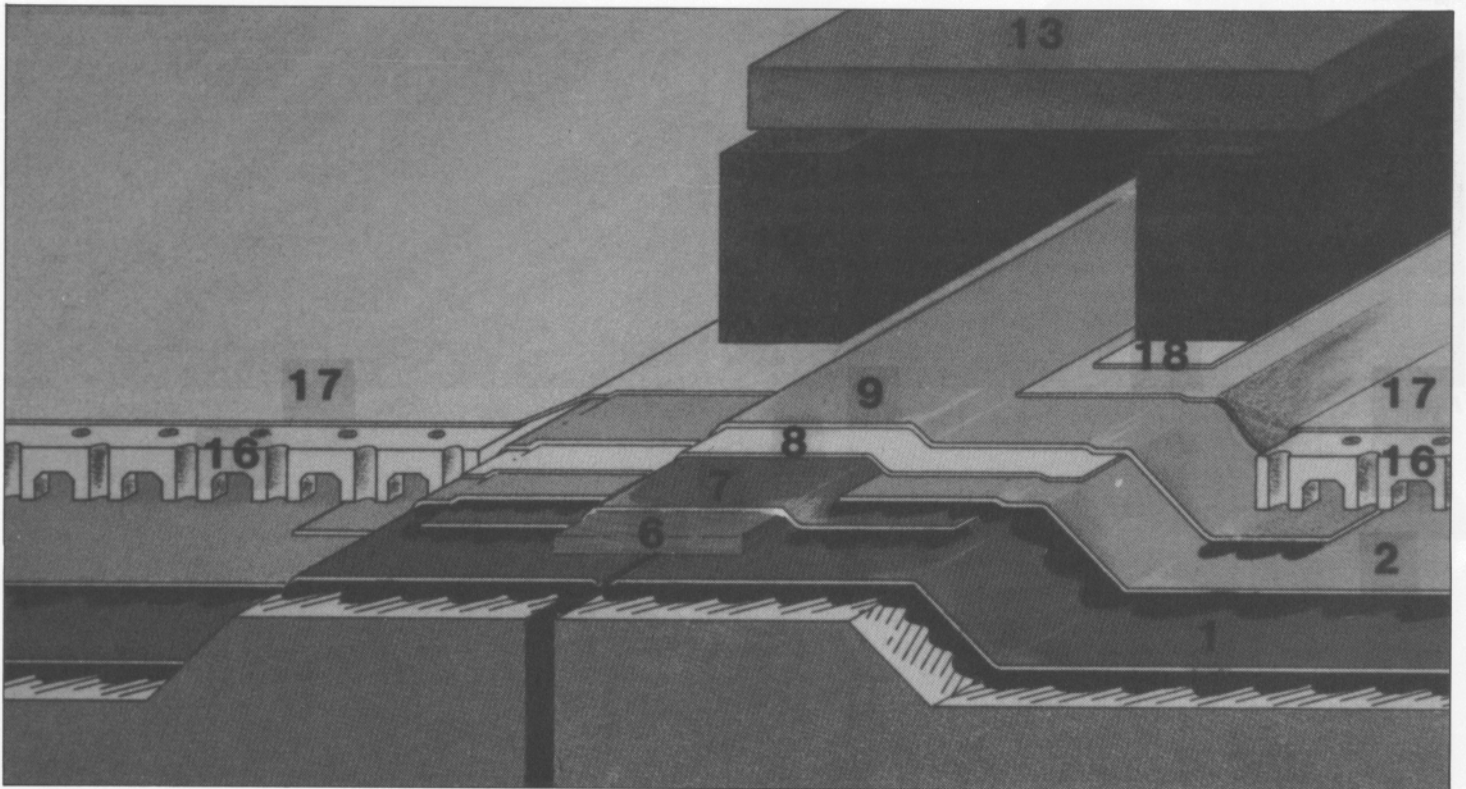


Figure 9

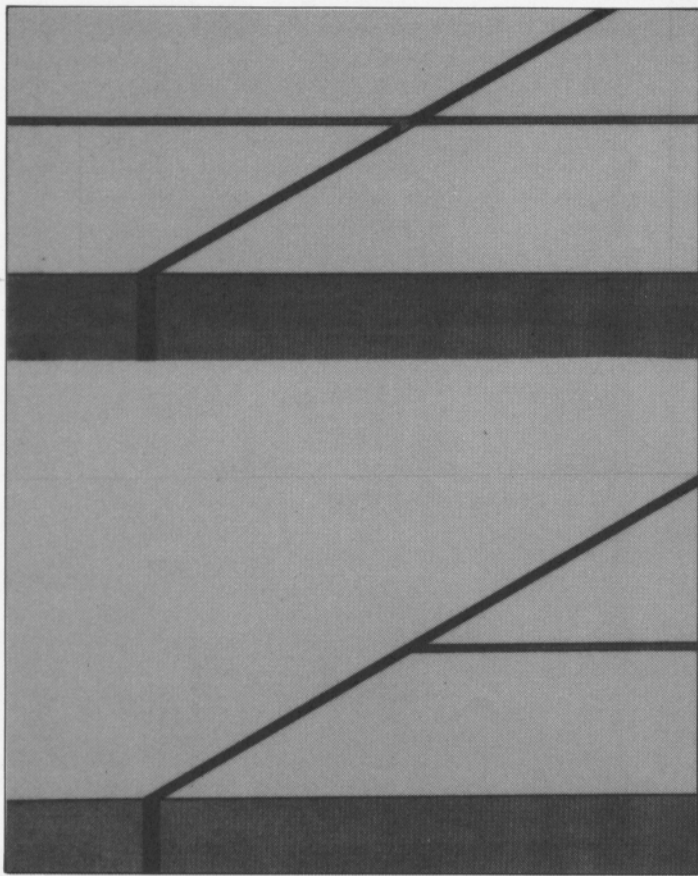


Figure 10

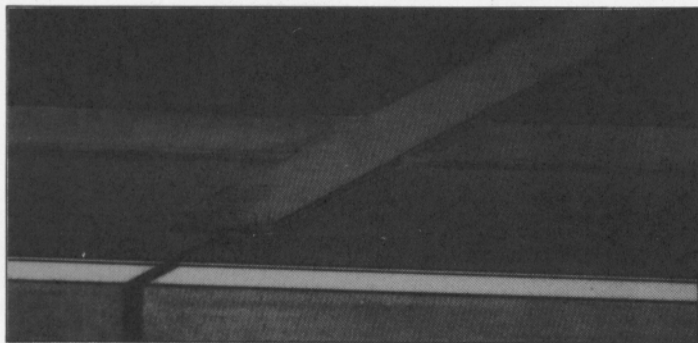


Figure 11

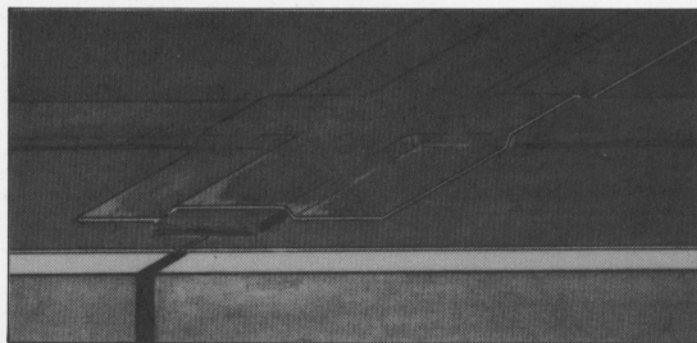


Figure 12

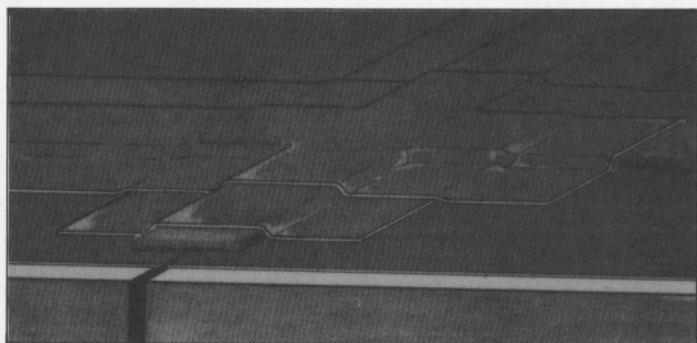


Figure 13

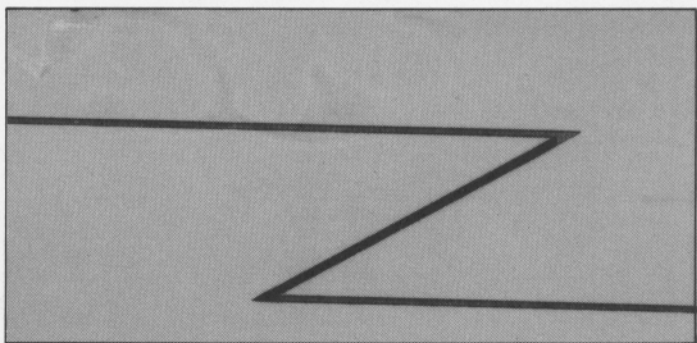


Figure 14



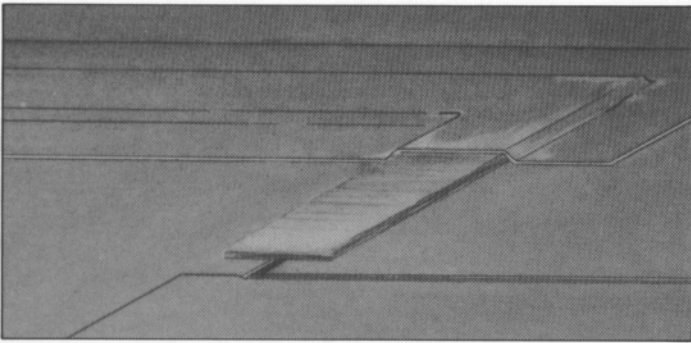


Figure 15

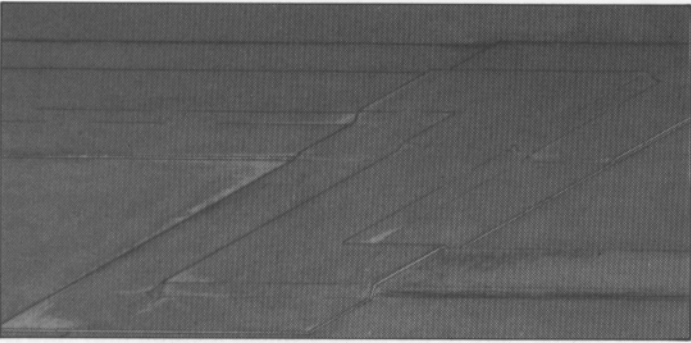


Figure 16

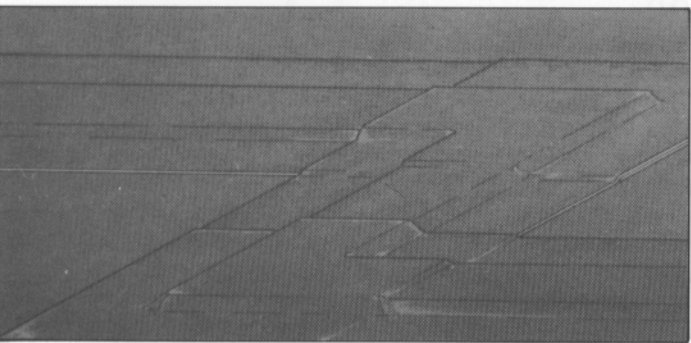


Figure 17

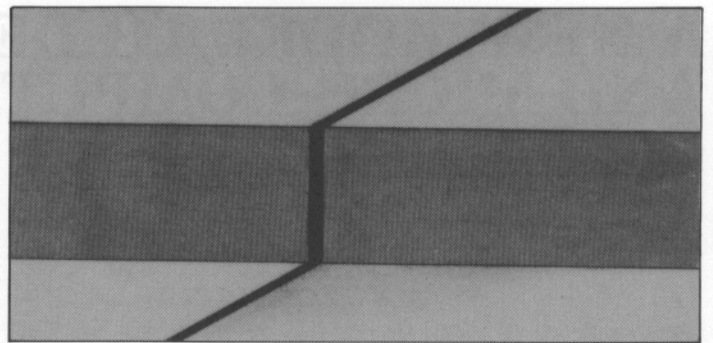


Figure 18

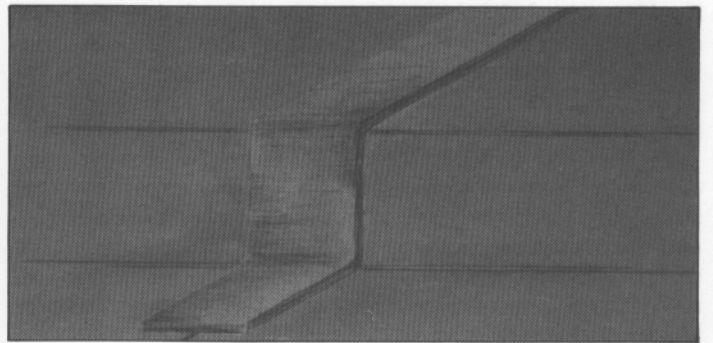


Figure 19

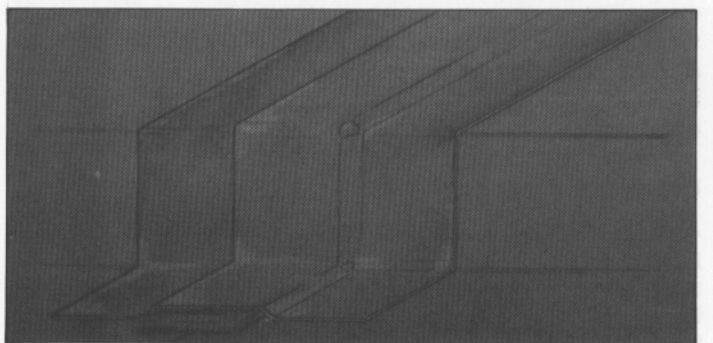


Figure 20