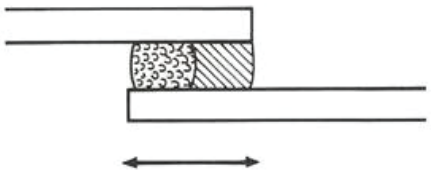
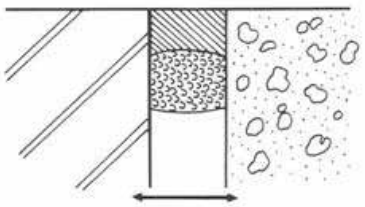
Joints in precast concrete cladding	Published Date: 17/12/2009

Joints can generally be split into two types, butt joints and lap joints. Lap joints have the advantage of being able to accommodate larger movement and being less obtrusive. However, they are difficult to install and maintain and are hence rarely used. There is also a triangular fillet joint but this should not be specified as it offers very limited movement capacity.

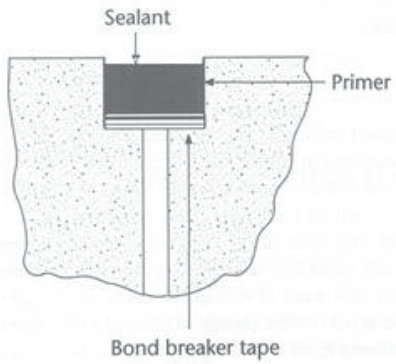


Butt Joint (diagrammatic)



Lap joint (diagrammatic)

It is good practice to apply a primer before using sealants even if the sealant manufacturer claims that it is not needed. Experience has shown that the application of a primer is extremely beneficial in reducing loss of adhesion to the concrete. It also reduces the possibility of staining/migration.

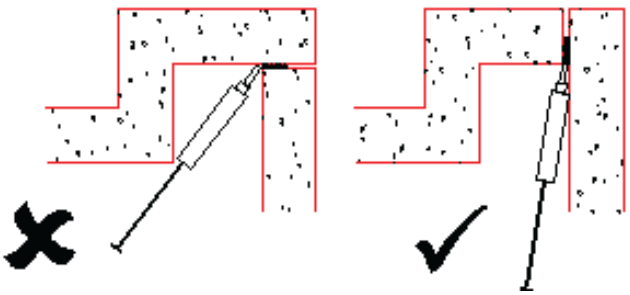


If the outer surface of the panel is 'rough' e.g. exposed aggregate/grit blasted, hen care must be taken that the actual joint surfaces are detailed and formed with a 'smooth' surface.

The 'design joint width' (the width of the sealant) may not always be the same as the 'gap width' (the clear space between units) as shown. Depending on the joint profile, the sealant may then come into contact with surfaces which are closer together than the design width of the joint. This reduces the distance over which the sealant can 'stretch' and can cause failure. In these cases a bond breaker is required in the form of a tape. This ensures that the sealant only adheres where intended.

On concrete, silicone seals should be nominally10 mm deep, regardless of the width, and not the often quoted 2:1 width: depth which applies to polysulphides. For joints over 30 mm wide, the depth may be increased to a maximum of 15 mm. Although not indicated in the diagrams above, it is good practice for the outer edge of sealant to be stopped some 2 – 3 mm from the front face of the joint. This minimises the risk of primer and sealant being accidentally applied to the 'seen' face. In the case of a recessed joint, this figure can be considerably greater.

Backing strip is usually in the form of closed cell, medium density, polyethylene foam strip or rod. The surface does not allow adhesion by the sealant. The size should be 20 – 30% more than the width of the gap into which it is to be compressed.



When positioning joints care is needed to ensure that the sealant gun can positioned so as to get into the joint. In the example shown, the left-hand detail may be shown by the Architect since it 'hides' the joint. However, it is not possible to get the gun into a suitable alignment, and hence the joint must be as the right-hand detail.

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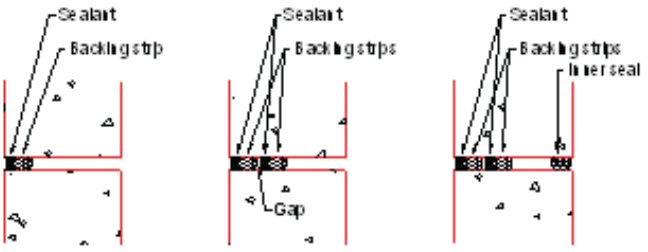
Careful attention to joints is needed to ensure that the joint fulfils both architectural and practical requirements.

Many details are available, but those shown below are some that have been used over many years and found to be successful. More elaborate or extreme details shown, for instance, on an Architect's drawings should only be considered in the light of what is known to be efficient.

The outer and second seals shown are usually 'gunned' mastic. The inner (third) seal is often a pre-compressed impregnated foam strip. This has to be be applied from the inside face, but not if panels have insulation with taped joints, or access problems such as against a shear wall or with structure behind. In practice, a properly applied double 'mastic' seal will be 100% impervious and an inner seal is superfluous.

The above details refer to 'plain' concrete panels. Where stone or brick facing is used, other details are needed. In particular, it is important that (at least) the inner seal is applied between two concrete faces. If this is not done then moisture may penetrate through fissures and imperfections, in the facing material, bypassing the seals.



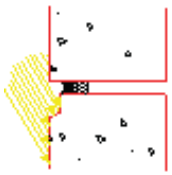
Single plain seal

Double plain seal

Triple plain seal

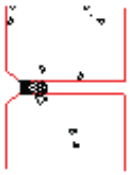
Plain seal has simple square faces. Front seal is recessed 2 - 3mm from the outer face of the concrete

A gap is required between outer backing strip and second seal Gap may require venting/draining



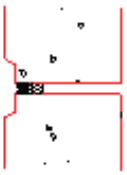
Simple shadow joint

The shadow formed by the overhang emphasises the joint line, and also reduces the rain onto the seal



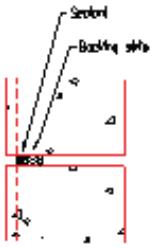
Shadow/ chamfer

Some shadow effect occurs. Chamfers allow much greater tolerance during erection



Rebated joint

The double rebate gives a prominant joint appearance as well as maximising the site tolerances



Recessed joint

This is essentially a plain joint detail, but recessed some 10-15 mm, often to match false joint depth

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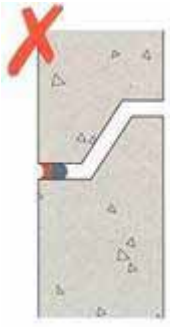
Joggle joints:

Some text books still show a joggle joint as being the most effective way of achieving a horizontal joint. Whilst this looks good on a drawing, there are several drawbacks.



It adds difficulty (and hence cost) to the precasting.
It is usually interrupted by the lifting inserts cast into the top of the panel.
It does not allow space for a secondary seal.
It does not allow future inspection.
It is more likely to trap any water running down the panel.
It makes alignment of vertical and horizontal seals very difficult.

A double silicone seal, properly installed, will be impervious, thus there is no need for a physical barrier in the form of a joggle. Generally these should be avoided.

Joint widths:

The width of joints is always a compromise. It must be large enough to fulfil the movement requirements of the joint. Methods of calculating the required widths are shown elsewhere. Architecturally there may be pressure to minimise the joint width to minimise visual impact. Narrow joints should in general be avoided for two reasons.

Industrial sealant gun nozzles are typically 15mm diameter. Narrow joints will not allow insertion of the nozzle far enough to install the inner seal, particularly if this is set further back to allow for applied surface finishes. It is possible to use a narrower nozzle but this has significant effects on the time taken to seal joints, with cost implications.

Joints serve a major role in accommodating the visual effects of tolerance. BS8297 allows tolerances on the width/height of panels. For even a small panel, this is ±3mm and for larger panels this can be up to ±10mm.

The examples below show the effect of applying just a 3mm deviation to a 16mm nominal joint and to a 10mm nominal joint.

Whilst the 16mm joint still leaves joints widths that are useable, the 10mm joint results in actual widths that would be very difficult to seal and would also be unlikely to be able to accommodate significant thermal movement. They would also be unacceptable visually.

Generally a 16mm joint is the preferred width, unless thermal movement dictates a wider joint.

Some details show a 15mm joint, this serves little purpose other than resulting in 'half millimetre' dimensions on the panels.