

## 3.2 APPLICATION TECHNIQUES

### BITUMEN PREPARATION

Oxidised bitumen is heated in boilers to a temperature in the order of 260°C or the flash point temperature less 15°C. The flash point temperature should be available from bitumen suppliers. It is a temperature derived from test, usually the Cleveland Open Cup method. Experience shows that boilers used to heat roofing bitumen are only at risk of fire at temperatures well above flash point, and flash point less 15°C gives a very adequate safety margin. Most oxidised bitumens used for roofing are at the optimum conditions for application at 240°C.

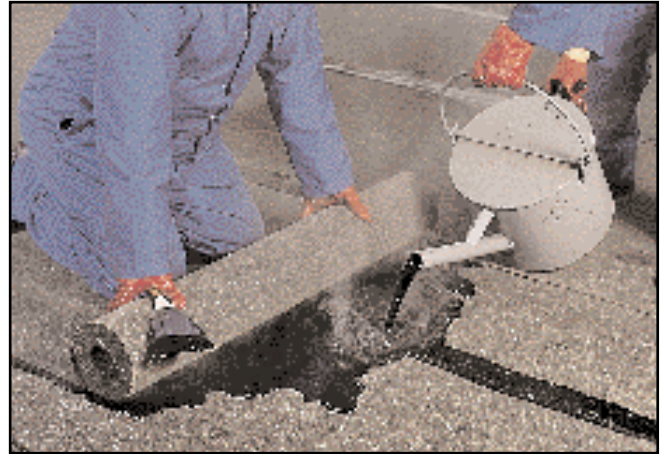
Bitumen boilers are usually placed at ground level but can also be placed on the roof, provided adequate fire precautions are taken and the roof area is suitably protected. The bitumen may be pumped from ground to roof level or transported in buckets, wheeled containers or dispensers. For safety reasons, lids are fitted to buckets and containers.

The handling of hot bitumen requires rigorous safety procedures to prevent splashing and possible burns and the work must only be carried out by roofers trained to the necessary skills.

When modified bitumen is used for hot bonding on site, the manufacturer's instructions must be carefully followed.

### PRIMING

In damp or dusty conditions it is usually necessary to apply suitable primer to bind any loose surface and it is usual to apply primer to all cementitious or metal surfaces as a precaution before the application of hot bitumen. Bond failure under test should be due to a breakdown of the bitumen rather than a release at the interface with the deck. Although bitumen will not bond to primer which is wet from rainfall or heavy dew, a reasonable bond will be achieved if there is merely a bloom of dampness of the sort which frequently occurs in winter.



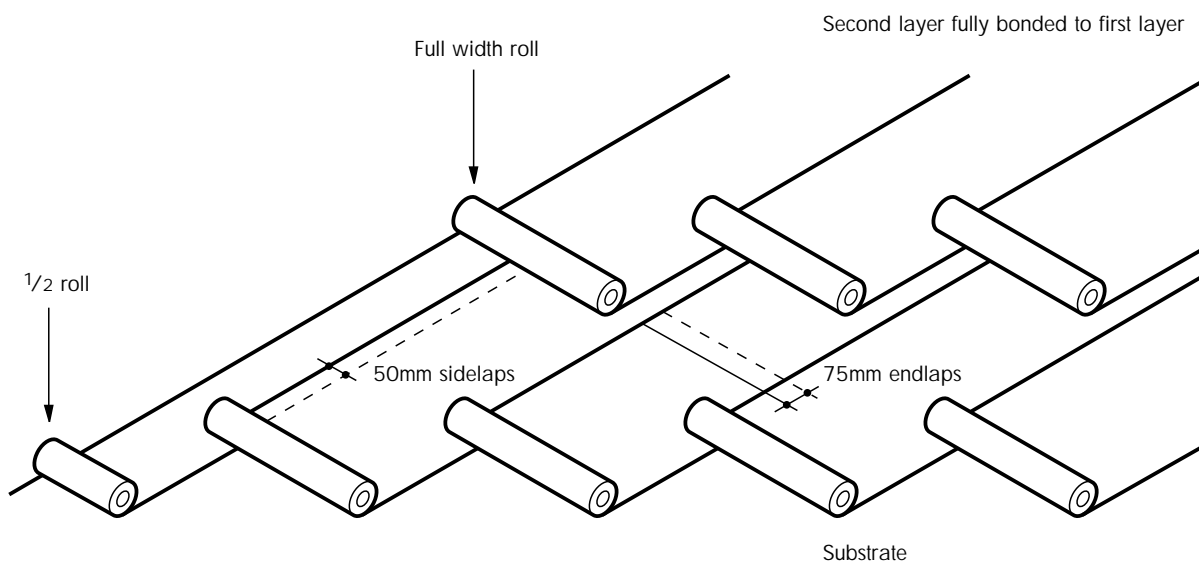
Application by pour and roll

### LAYING THE ROOFING 'POUR AND ROLL'

Hot bitumen is poured in front of the roofing which is then unrolled into the bitumen, spreading it to give a continuous coating for the full width of the roll. This technique known as 'pour and roll', is used for bonding built-up roofing and vapour control layers.

Alternatively the bitumen may be applied by mop, but most coated roofing materials are only satisfactorily bonded by this method if the bitumen is applied to the back of the roofing and to the surface to which the roofing is to be applied. Mopping is generally only used for detail work and the main areas are usually applied by the pour and roll technique. Detail work may also be carried out by torching or by pour and roll using jugs to hold a relatively small quantity of hot bitumen and ensure a safe and accurate application.

Most bitumen roofing is applied with minimum 50mm side laps and minimum 75mm end laps. On sloping roofs, the roofing is applied from eaves to ridge, but on flat roofs to falls the direction of application will not necessarily relate to the direction of fall. The formation of details, the economic use of materials and the need to leave a satisfactory edge for



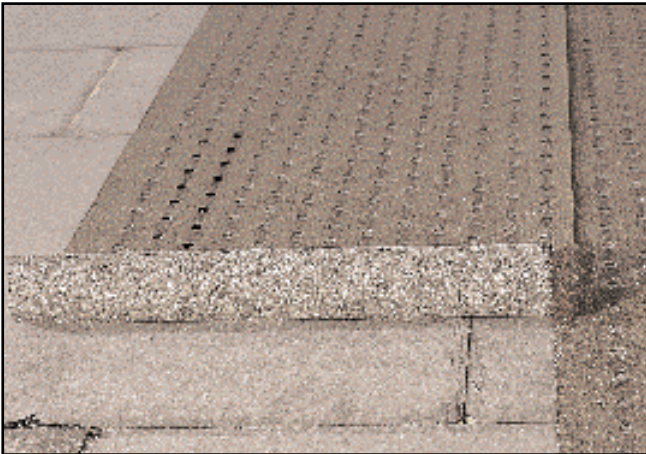
Formation of staggered sidelaps

closing off at the end of a day's work will all be taken into account by the experienced roofer when deciding the direction and patterning of the roofing.

The laps should be staggered between layers to ensure maximum lap security and to avoid an increased thickness from forming one lap on top of another.

The stagger is formed by offsetting the second layer using a part width roll to form the offset, or leaving the offset to be completed as part of the skirting or edge detail.

Part bonding is most usually formed by the use of BS 747 type 3G perforated roofing. This is applied loose and the bond is achieved by rolling and pouring the second layer over the perforated layer, so that hot bitumen runs through the perforations to form a spot bond.



Application with type 3G to give a partial bond



In order to maintain a clean and tidy appearance to mineral surface roofing, the excess bitumen which emerges at the lap should be removed. To facilitate this the preceding layer of mineral roofing is wetted to prevent adhesion of the excess. This excess can then be carefully cut and removed manually to leave a clean finish.

It is undesirable to carry out large areas of first layer work as a temporary waterproofing. Building supervisors are often tempted to press the roofing contractors to adopt this practice, but the quality of finished work is bound to suffer by the entrapment of dampness, dust and dirt deposits. The best procedure is to complete all the layers of roofing as the work proceeds and to add the protective surfacing as soon as possible after application of the built-up roofing. A



Wetting the edges and removing the excess bitumen



vapour control layer can be used to give a temporary waterproofing, as the consequences of small traces of entrapped damp or dirt at the interface of this layer and the insulation should not prove a cause for concern.

Some polyester felts are rather heat sensitive and cockles, or rounded ridges, can be produced from the heat of the bonding bitumen during the application process, although they are generally not extensive and take the form of minor wrinkling. The action of the formation of the cockling is from thermal expansion of the base and such wrinkling often disappears as the material settles in warm weather.

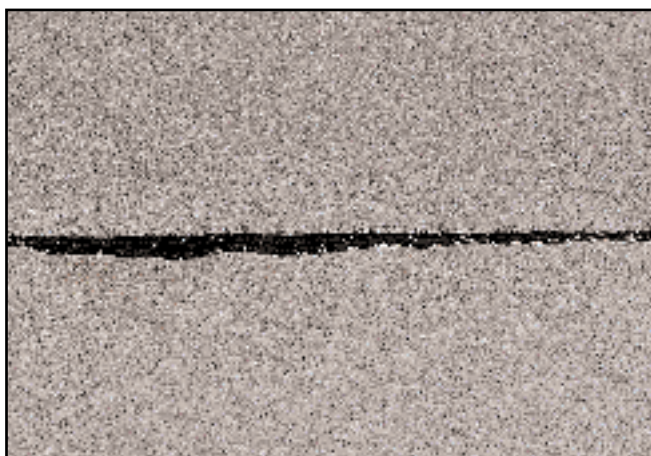
#### TORCH APPLICATION

It is important that a full and continuous bond is achieved by torching, to compare with the bond achieved by bonding in hot bitumen. To do this, the torch is played on the face of the roll until molten coating runs down to form a continuous flow of hot coating in front of the roll. The torch-on material is rolled forward into the flow of bitumen whilst the torching operation continues, and the flow of bitumen is maintained in front of the roll. This allows the torch-on material to achieve continuous bonding, and the flow of bitumen ensures that air is not trapped under the roofing.

When correctly applied, a small bead of bitumen should appear from under the lap and is a good indication that the material is well bonded. The bead of bitumen should remain in position. When mineral surfaced torch-on material is used, the bead can be concealed by sweeping loose mineral granules onto the bead whilst it is still hot.



Torch application; note the bead of bitumen at the lap



It should never be taken for granted that a roof is suitable for torch application. It is necessary to take account of combustibility of the deck, walls, rooflights, insulation and particularly any concealed insulation in wall cladding at skirtings. If any of these are likely to present a fire risk, no attempt should be made to use a gas torch.

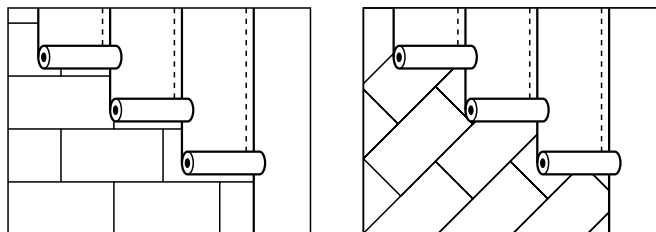
A reduced risk of causing fire can be achieved by the use of hot air torches available from specialist suppliers. These derive their heat from gas but the flame is hidden inside the burner of the torch and no naked flame is visible. The temperature of the air is extremely hot, however, and great care is still necessary to avoid catching fire to combustible materials.

The FRCAB information sheet No.12 Torch-on roofings gives further advise on fire safety, and gas torch equipment.

#### APPLYING THE INSULATION

Most insulations are bonded in hot bitumen, with joints staggered to minimise joint movement. A full half stagger on the longitudinal joints is to be preferred.

On metal decking the boards are normally applied with long edges running across the channels of the deck. Alternatively a diagonal pattern of application helps to avoid unsupported board joints but introduces difficulties in forming effective temporary night seals.



Alternative laying patterns

#### BONDING OF INSULATION TO SOLID DECKS

As with many aspects of roofing work, there are a variety of application techniques for achieving a bitumen bond of insulation board to the deck. A continuous coat of hot bitumen can be applied to the deck by in-situ pouring to leave a pool of bitumen which is then spread with the edge of the insulation board which is about to be laid. As an alternative the substrate and the underside of the insulation board can be mopped with hot bitumen, and the insulation pressed into position.

The bitumen should be applied with sufficient thickness to ensure a satisfactory contact area, but it is almost impossible to achieve a 100% contact area due to variations in surface level, and indeed this is unnecessary.



Application of insulation board



### **BONDING TO METAL DECKING**

On metal decking an alternative method of bonding the insulation or vapour control layer is with bitumen poured direct to the deck. One method is to use dispensers which pour bitumen from spaced holes. The insulation or vapour control layer is then applied direct to the bitumen and a good contact is obtained in strips which normally spread to widths between 25mm and 50mm.



*Application of vapour control layer to metal deck*

### **TESTING THE BITUMEN BOND**

The bitumen bond of the insulation should be tested at random during the progress of the work and should withstand a strong pull using the normal strength of a man before the board releases. Examination after a test will usually reveal areas with little or no adhesion but this is normal and the important criterion is the strength of bond overall. If the board releases easily when pulled, it is necessary to examine the form of failure to ensure that sufficient bitumen has been used.