

PREFABRICATED PANELS FOR BUILT-UP ROOFS

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Traditionally, roofing is a conservative trade in which working methods often seem primitive when compared to other trades. In the last few years, however, there has been rapid development in materials. Today roll roofing products are available with properties, especially elongation, far surpassing those available only a few years ago. However, this does not necessarily mean that the vinyl roofs perform better.

Modern building systems have shortened building times considerably. What is more, they allow year-round building, which was unthinkable earlier. This has been achieved by a high degree of prefabrication. Now on-site work has the character of a rational installation process.

Many time-consuming operations are carried out by the manufacturer or supplier, and have been completed when the product is delivered to the site for installation. The roofing panels have been developed as a natural consequence of this trend. Combining insulation and the roofing membrane before delivery to the site has made it possible to reduce installation time by more than 30 percent when compared to conventional roofing practice. The time-consuming and delicate mopping operation has been eliminated.

SYSTEM COMPONENTS

The system is composed of the following products:

The Panel (Figure 1) consists of an insulating board with a roofing membrane on top. The insulating board is made of mineral wool with a minimum density of 180 kg/m³ (about 12 pounds per cubic foot). The membrane is a high penetration grade of oxidized bitumen (95/35) reinforced with a heavy polyester mat covered with roofing granules. Table 1 gives the properties of the membrane. Panel size is 1200 x 2400mm (about 4' x 8') and its thickness can vary from 20 to 100mm (¾ to 4 inches).

Sealing Strips (Figure 2) are based on high penetration grade oxidized bitumen reinforced with a polyester mat. They are designed for torch-on application.

Mechanical Fasteners are screws or nails specially made for the system. They are used with galvanized steel or plastic discs with a minimum diameter of 75mm (3 inches). (Figures 3, 4, 5 and 6).

INSTALLATION

The product is applied to an underlying structure of wool, steel sheet, lightweight concrete or concrete. Often the roofing panels are combined with additional insulation to achieve the final thickness wanted (Figure 7).

The roofing panels can also be applied to old roofs. This has proved an excellent renovation technique, because the

old roof membrane does not have to be removed, even when it is in poor condition.

The roofing panels are mechanically anchored to the underlying structure. Fasteners are installed in the long edges of the panel with the number of fasteners determined by wind uplift conditions (Figure 8).

Wind uplift studies on the roofing system have been done in a wind uplift simulator (Figure 9).

The result of the wind uplift investigation is shown in Figure 10. Finally, to ensure a perfect waterproof joint between the panels, bituminous strips are torched by a special machine, which heats the strip with a flame. (Figure 11).

Joining and waterproofing involves two steps. First with one 120mm (5 inches) wide sealant strip is applied and then a second strip 240mm (10 inches) wide. This gives a watertight joint, which also can accommodate possible roof movement. (Figures 2 and 12). Figures 13, 14 and 15 show how flashings, gullies and vents are installed.

MANY ADVANTAGES

In comparison with conventional roofing technique, the panel system has several advantages.

High Quality

Factory prefabrication of the panel provides complete control over bitumen temperature during the gluing operation, bitumen quantity, moisture and temperature. This gives a reliable bond between the insulation and the waterproof membrane.

Raw material and product quality can be effectively controlled.

Swift Application

As each panel covers a reasonable area, 1200 x 2400mm, laying is fast and does not demand any special qualifications.

The roofing membrane is laminated before delivery; melting and mopping bitumen are eliminated.

Mechanical anchoring is fast and simple compared to gluing.

Lap sealing produces a completely waterproof roof, quickly and simply.

Reduced Weather Dependence

The quality of conventional roofing is strongly affected by external factors, such as rain, snow, cold weather, wind and the quality of installation labor.

The roofing panel technique overcomes many difficulties. The system described not only produces a good end result, it also produces an absolutely tight and well functioning roof quickly.

Good Economy

The end result is low cost. Installation time is more than 30 percent less than conventional roofing.

The thinnest 20mm panel makes it possible to use inexpensive insulation beneath, since the panel distributes superimposed loads.

The building gets a waterproof roof quickly, helping hold down construction time and costs.

Practical Experience

This roofing panel system has been used in Sweden since 1976. About 4 million m² (about 43 million square feet of roof areas have been laid. The system is applicable to low sloped roofs with slopes up to 9 percent and is approved by Swedish testing authorities.

Thanks to the simplicity of the system, the number of complaints is considerably less than with traditional built-up roofing.

Tensile strength, kN/m	30
Elongation of break, percent	45
Perforation Resistance, N	1250
Thickness, mm	6
Weight, kg/m ²	7

Table 1 Properties of the membrane, tested according to Swedish Standard SIS 23 68 05

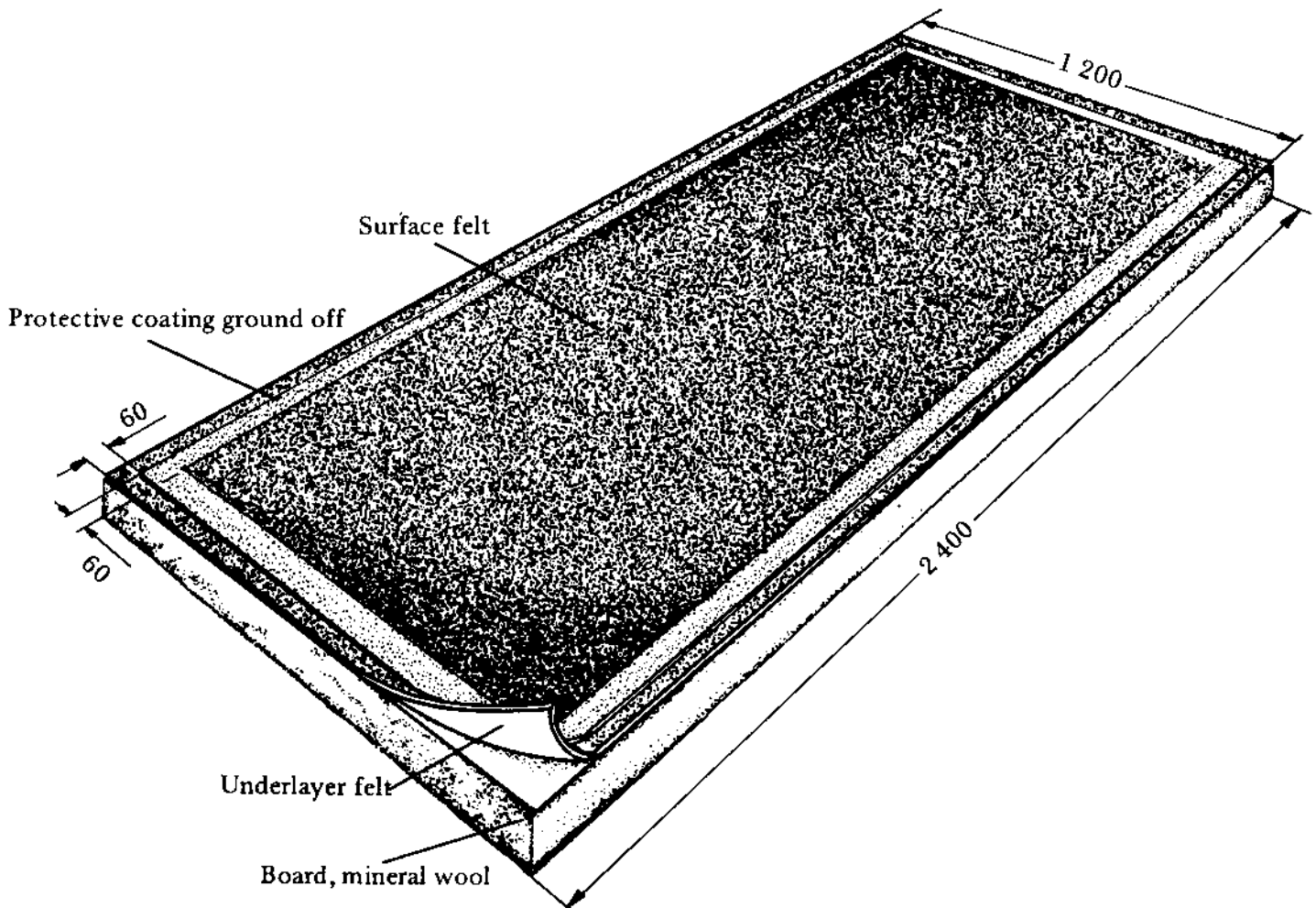


Figure 1

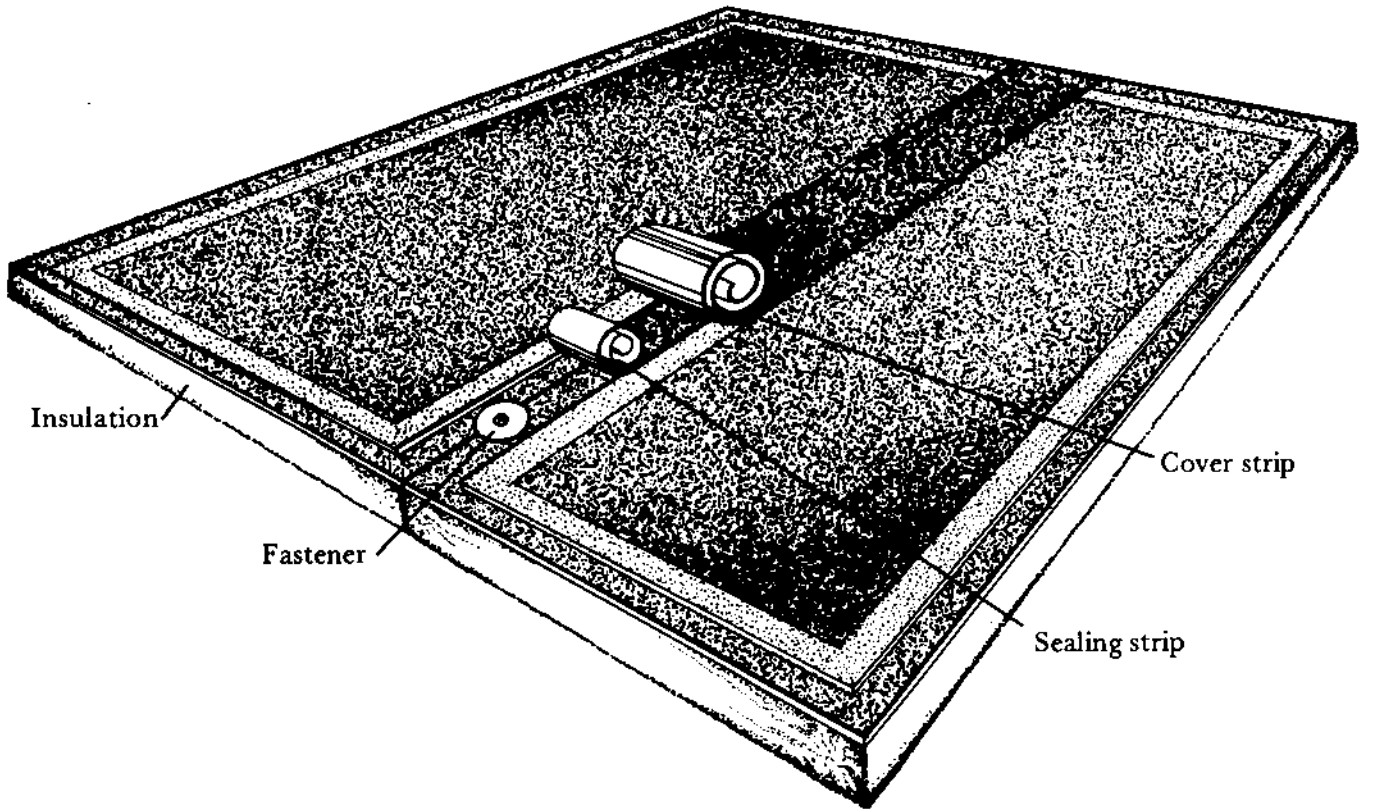


Figure 2

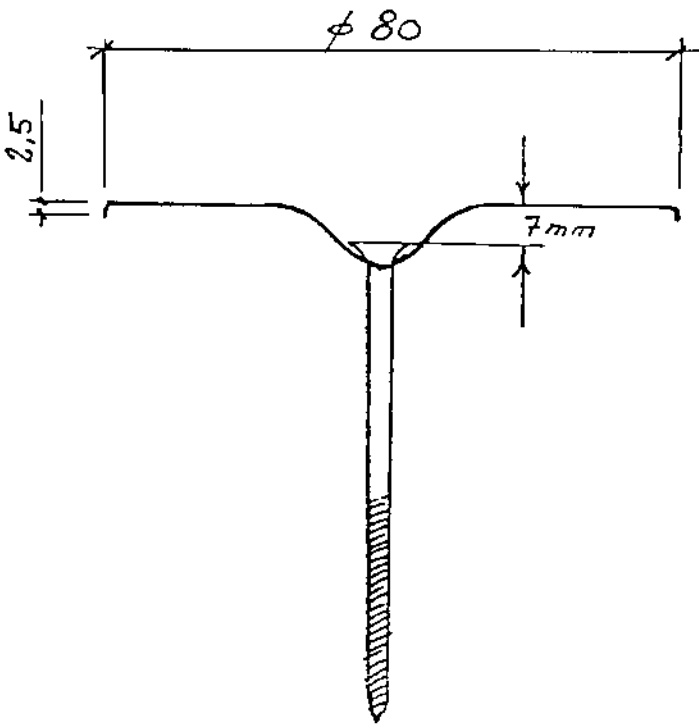


Figure 3 Fastener for steel sheet

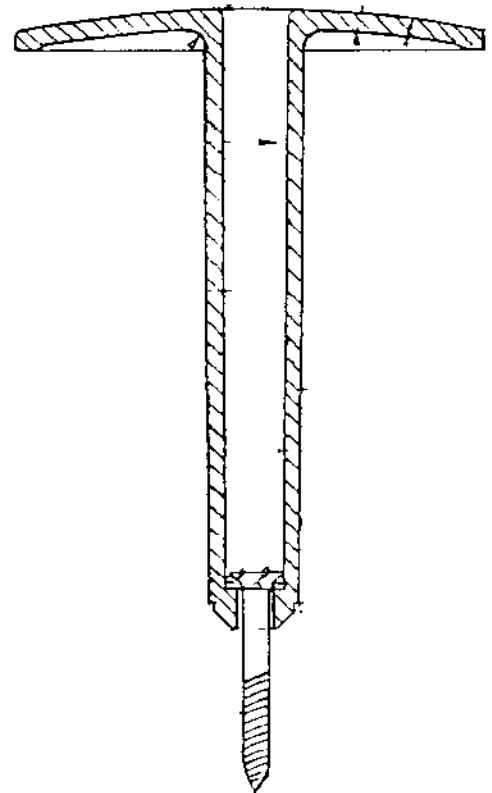


Figure 4 Fastener for steel sheet

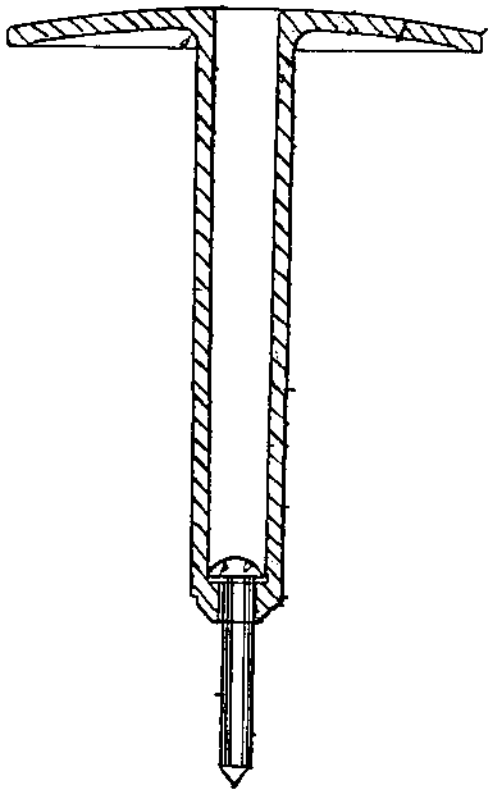


Figure 5 Fastener for concrete

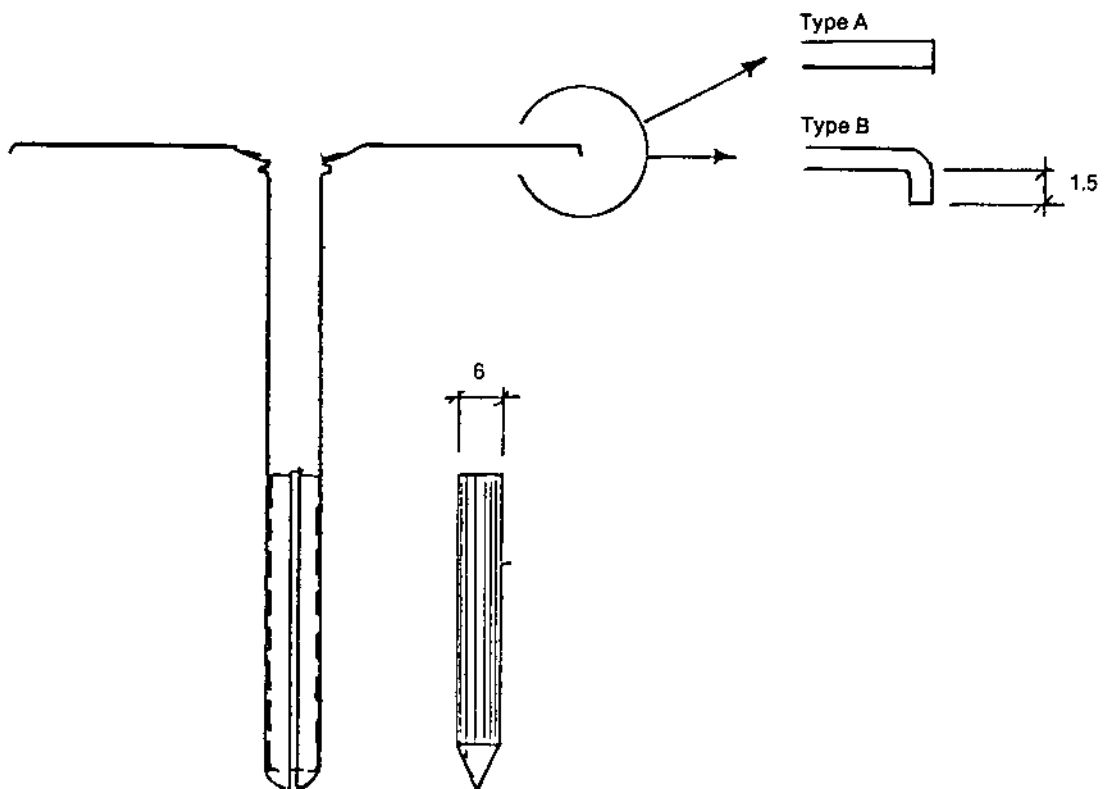


Figure 6 Fastener for lightweight concrete

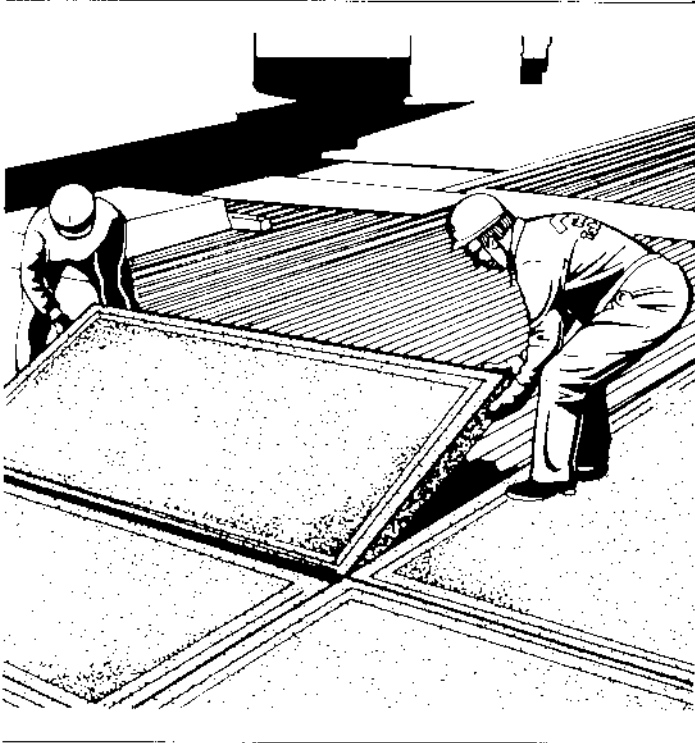


Figure 7 The prefabricated roofing elements are layed onto the steel deck

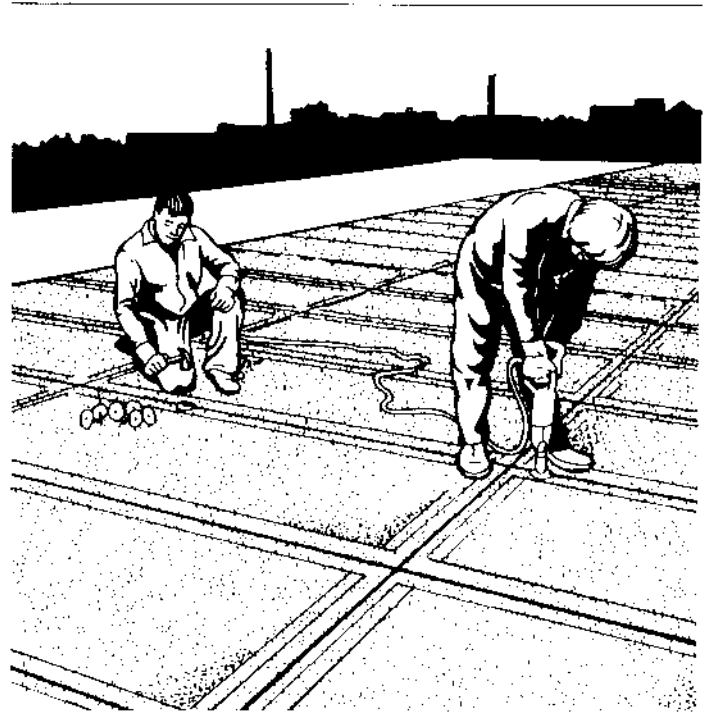


Figure 8 The elements are mechanically fastened to the steel deck

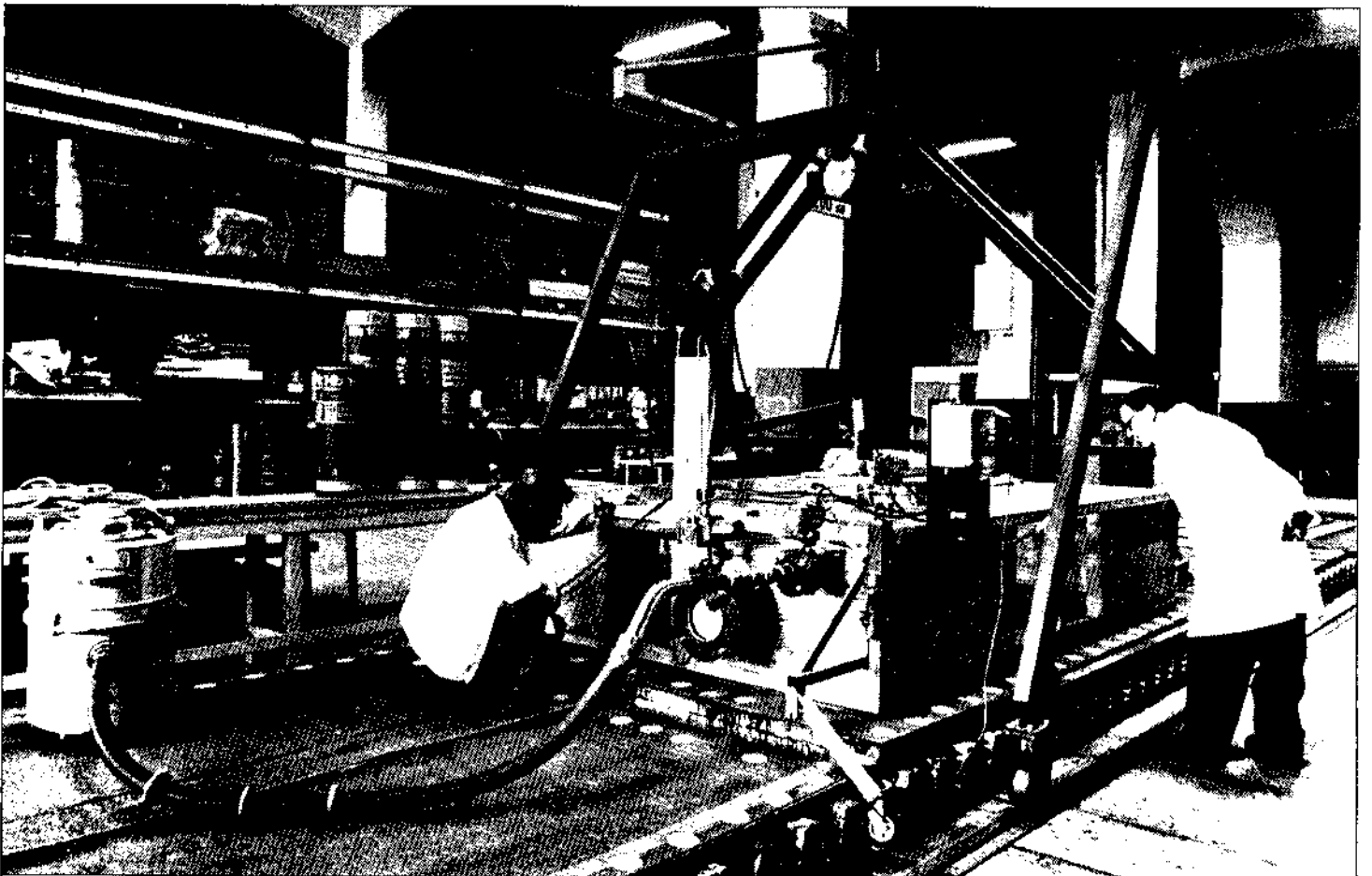


Figure 9

Minimum number of fasteners required

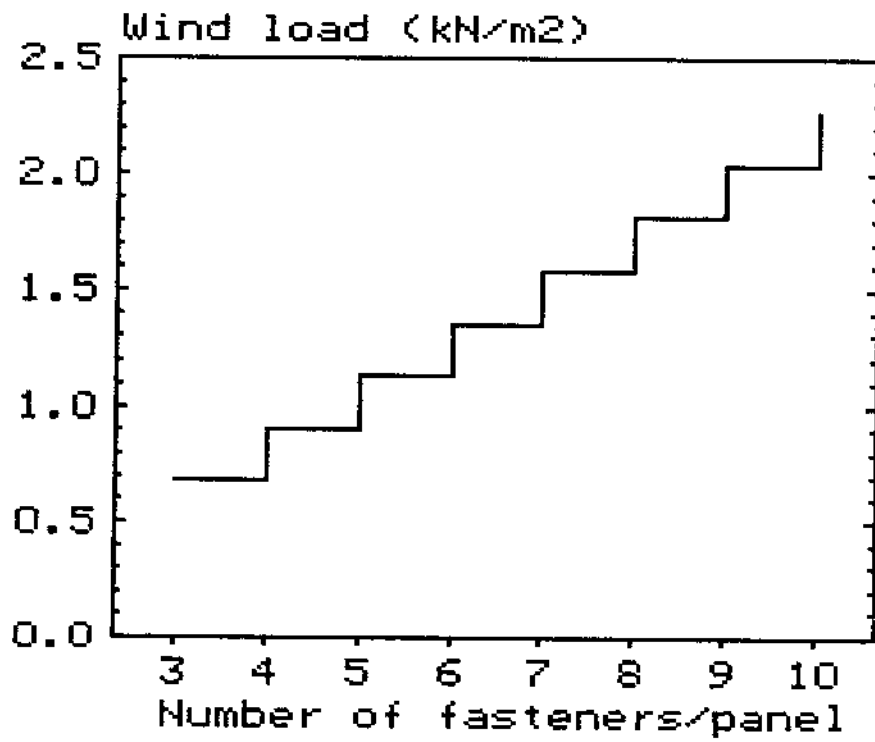


Figure 10



Figure 11 Special joint strips are applied by a welding technique

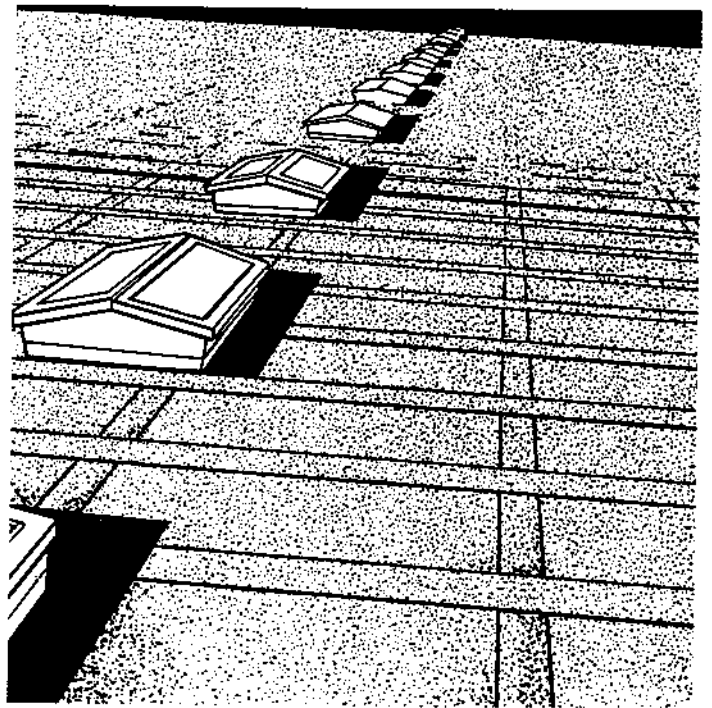


Figure 12 The final result

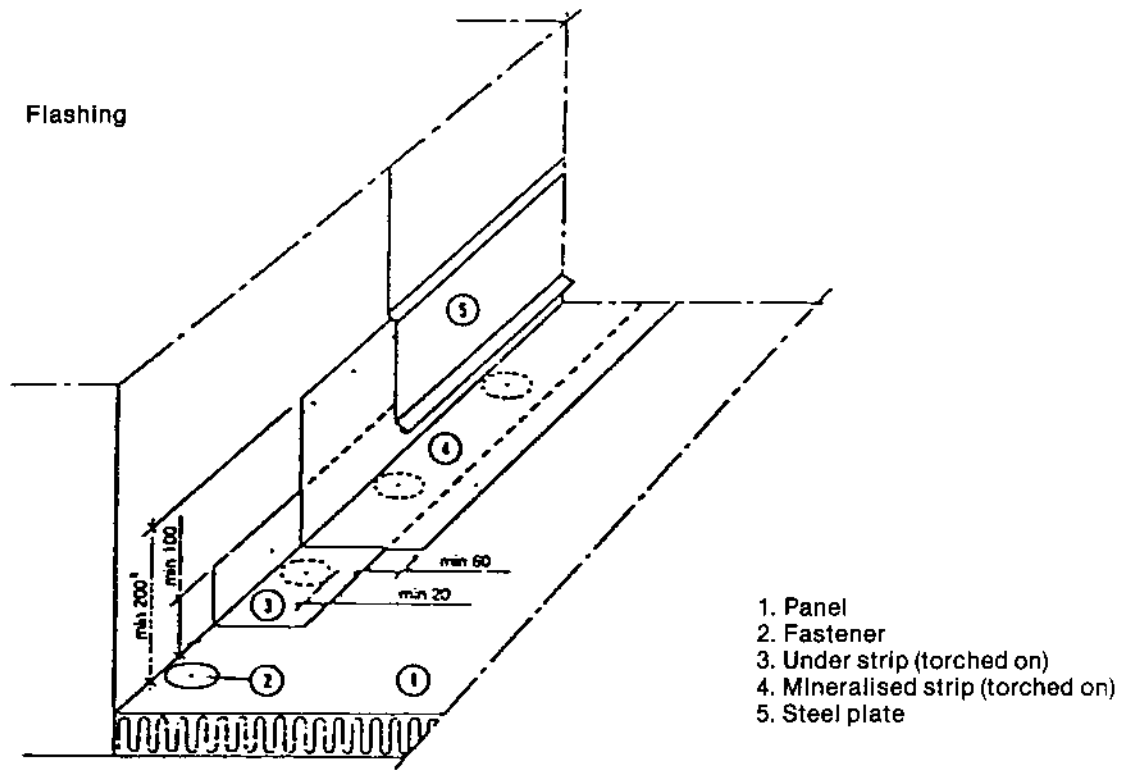


Figure 13

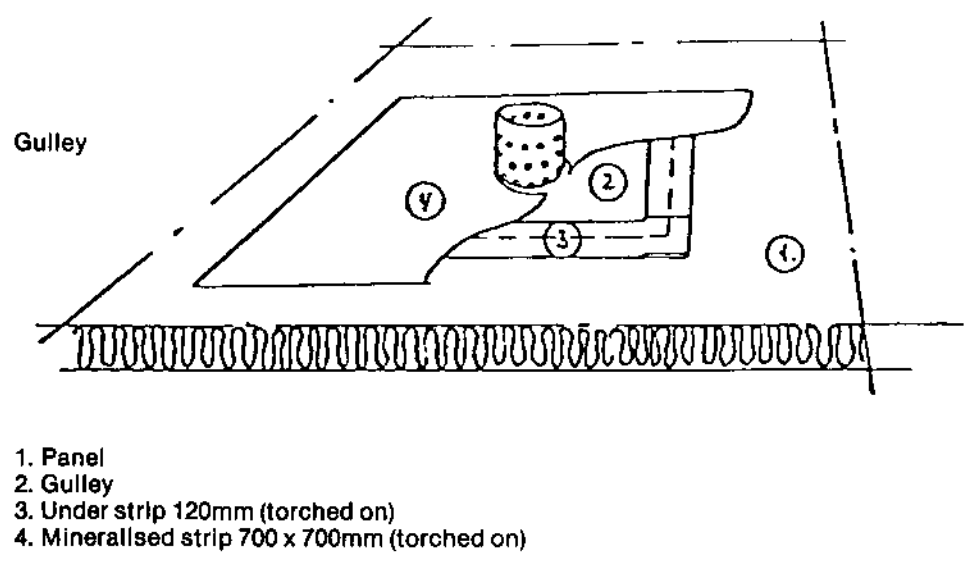
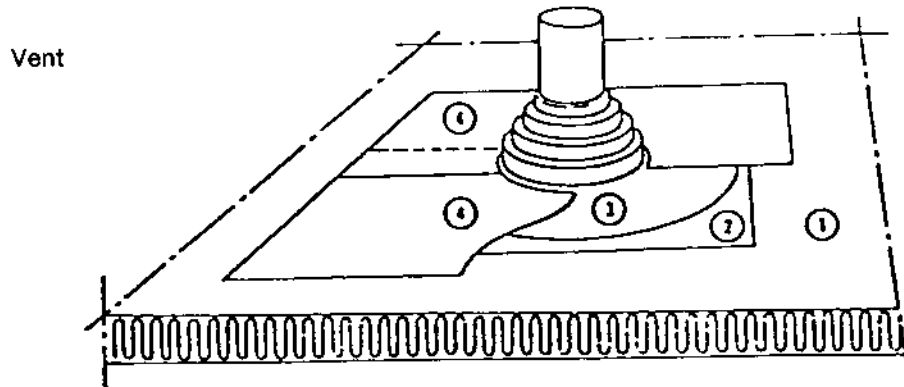


Figure 14



1. Panel
2. Under strip (torched on)
3. Rubber vent
4. Mineralised strips (two)

Figure 15