

## INTRODUCTION

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**T**he design of re-roofing specifications follows the same principles as new work, but with added complications arising from the need to adapt, re-use or overlay existing materials, or to strip and replace the existing roof specification.

The designer no longer has complete freedom of design and may be restricted to the practice, good or bad, employed on the original building. Perhaps the only advantage is that the whole roof is time tested, and it would be reasonable to repeat the features which have proved successful and modify those which have proved unsuccessful.

## INSPECTION

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An inspection is necessary to determine the limiting factors which will influence the design and selection of materials. The inspection must take into account the condition of the supports, the roof deck, the insulation and the waterproofing.

## STRUCTURE

The structure must be investigated to determine whether it is capable of taking additional load, and whether any special limitation on loads must be imposed during re-roofing, including the loads from the placing of boilers and the storage of new materials on the roof.

Similarly, the roof deck must be examined for condition and load bearing capacity. Sometimes it is impossible to gain access for the inspection from below and test cuts from above may prove necessary.

Timber decks and other degradable or non-durable decks should always be fully examined. If they cannot be inspected from below, it will be best to strip off the existing insulation and roofing entirely to ensure a full inspection of the roof deck during the progress of the works.

The load bearing performance of proprietary decks can be checked with manufacturers, but professional advice may be necessary in the case of concrete decks. Metal decks are easily checked by calculation methods, and a calculation service is normally provided by manufacturers or specialist roofing contractors.

The span of metal decks is often limited by the criterion of deflection or stiffness, and there may well be a reserve of load carrying capacity. An overlay of new insulation and waterproofing will add extra load and add to permanent deflections, but it is also likely to improve the load distribution on the deck and increase the feeling of stiffness underfoot. Small increases in permanent deflection might therefore be accepted, provided the new covering is designed to improve the load distribution, and provided the ultimate load bearing capacity of the deck is adequate.

## INSULATION

If the existing insulation is moisture sensitive, it is likely that the parts near to a source of leakage are wet or degraded and will need replacing. Treading the area concerned may reveal soft patches which require attention. Otherwise it will be necessary to take moisture readings, or make test cuts near the source of leakage or at random over the roof.

Electronic, infra-red and other proprietary methods are also available to survey large roof areas. They give an indication of water content by temperature variations or by radiation methods. The work must be carried out by trained specialists who will submit a detailed report on the possibility of water in the insulation.

A check may also be necessary on the efficiency of attachment of the existing insulation to the deck. This may be below standard either because it was applied to low standards in the first place, or because of breakdown or release of the original bonding bitumen.

## WATERPROOFING

If the original waterproofing is to be left in position, its condition will influence the design of the new work. The worse the condition of the existing waterproofing, the more it will be necessary to isolate the new work from the old.

The new specification must take account of the attachment of the original work, and this may influence designers towards complete removal of the existing work or to the addition of extra fixings or loading coats.

Detail work usually presents the greatest problem in re-roofing. Kerb heights and skirtings may be too low and prevent the application of extra insulation, or even the application of extra waterproofing. Rooflights, patent glazing and ventilators must often be entirely removed to allow access for the formation of the new waterproofing detail. Kerb heights may need to be increased, and new flashings may be necessary.

If the original waterproofing is to be left in position, some of the detail work can also be retained, but as a general rule skirtings must be removed entirely and reformed. Metal cappings and flashings can often be reused, but bituminous flashings will not be suitable for reuse, and there is practically no chance of lifting and resealing them successfully.

Metal trims can be reused, but the original roofing should be removed from the bonding face and the trims reapplied as for new work. Similarly the original roofing should be removed from rainwater outlets and pipes, and the detail completed as for new work.

## RE-ROOFING PROCEDURES

When considering the design of the specification, the reason for the failure of the original must be understood. If old age is the reason, the re-roofing will be straightforward, as there will be little to change. If the roof has suffered premature failure, the re-roofing specification must take account of the factors involved.

Having established the condition of the existing roofing specification, a number of alternative approaches to roof renewal can be considered:

### OVERLAY

- A single layer torch-on waterproofing applied over existing waterproofing.
- A new waterproofing system applied over the existing waterproofing.
- New insulation and waterproofing applied over the existing waterproofing.

### REPLACEMENT

- Strip and replace the existing insulation and waterproofing.
- Strip and replace the existing deck, insulation and waterproofing.

## OVERLAY

### SINGLE LAYER TORCH-ON WATERPROOFING

The single layer torch-on system fully bonds a new thick surface layer onto the existing waterproofing. The old waterproofing will act as a backing to the new and provide a measure of lap security.

This system is satisfactory for upgrading old built-up roofing and mastic asphalt roofing which is in basically sound condition and only giving occasional trouble. It is not normally the specification to use in an attempt to turn a widespread failure into a long term success. The new layer will be subjected to all the movements of the original, which will be most severe when the roof to be recovered has failed from extensive fatigue. In practice, it will be asking rather too much of a single layer system to provide a long service life under these conditions. It will be better to separate the new waterproofing from the old by a layer of insulation.

If the single layer torch-on specification is chosen, there are a number of conditions which should apply:

The old roof covering must be basically sound, rot-free, not saturated with water, and the insulation or deck below must be in a generally dry condition.

The roof surface must be clean, dry, and firm. An application of primer will normally be required to bind the surface and ensure good adhesion. The strength of bond should be tested during the progress of the work by pulling back on the new material after it has been applied and has cooled.

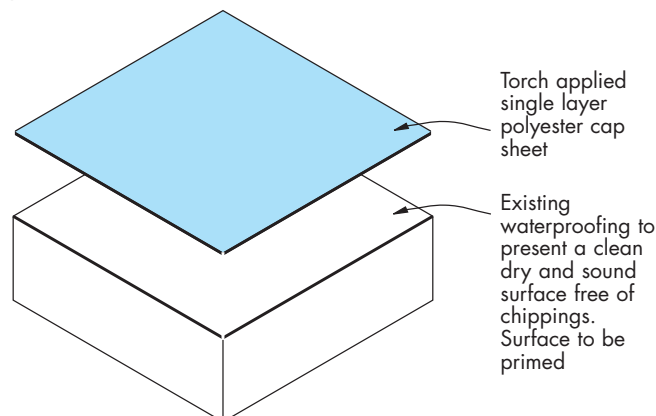
The existing surface must be generally free of blisters and ridges. Minor blistering would be acceptable providing the blisters can be cut away or repaired, to leave a clean, firm surface.

If the original waterproofing has a stone chipping finish, this must be removed to leave a sound surface.

Torch-on materials are applied with powerful torches, and it is likely that flames will come into contact with all the materials in the close vicinity of the work. Great care is therefore necessary during

application to control the risk of fire and under some circumstances the use of torch-on materials would be inadvisable.

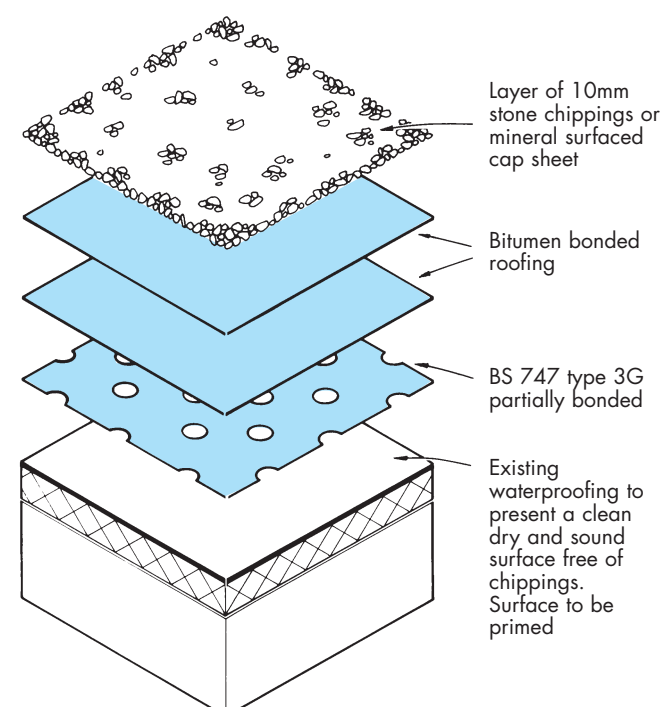
Whilst it is often satisfactory to leave the existing waterproofing in position at details, circumstances will arise when the existing materials must be cut away. If a chase is to be reused, the old roofing will be cut away and the new skirting formed on what is probably a rough and uneven surface. Under these circumstances, a new single layer skirting may not prove satisfactory due to the difficulty of ensuring lap security, and a two-layer skirting formation will be preferred.



### NEW WATERPROOFING SYSTEM OVER EXISTING WATERPROOFING

Old waterproof coverings may be re-roofed with the direct application of the full range of built-up roofing materials. The existing insulation must be sound and effective and the surface of the existing waterproofing must be firm, clean, and sound. It must be possible to remove chippings and blisters to leave a satisfactory surface.

Particular precautions need to be taken with overnight seals, as large volumes of rainwater can be trapped on the existing waterproofing. This must be prevented from flowing along the interface between the new and the old roofing.



A part-bonded specification will be necessary, probably using BS 747 type 3G for the first layer. The surface of the existing membrane will normally need to be primed to ensure good adhesion through the perforations. The quality of adhesion can be tested during the progress of the work by pulling back on material which has been applied and cooled.

The design and selection of the specification will follow exactly the same procedures as described for new roofing, and an equivalent performance to that of a new roof should be achieved. The partial bond will isolate the new covering from movement to a useful extent, but if the old waterproofing has failed through extensive movement or fatigue, or if the existing surface is badly broken down, it will be best to allow for the extra isolation and improved surface which is obtained by overlaying the existing waterproofing with a fresh layer of insulation.

Asphalt is not normally used over existing built-up roofing unless separated from the existing waterproofing by a new layer of insulation as described below. However, it can be utilised to upgrade an existing asphalt roof. The existing asphalt is overlaid with a loose talc surfaced, APP modified glass fibre based torch-on felt (installed with 50mm minimum laps which are torched sealed). 20mm two coat asphalt is then applied directly to the felt without a separating membrane.

#### NEW INSULATION AND WATERPROOFING OVER EXISTING WATERPROOFING

Old roofs can be re-roofed with confidence using an overlay of new insulation, even if the old roof has suffered major movement or fatigue failure. It is only necessary for the existing insulation to be in sound condition.

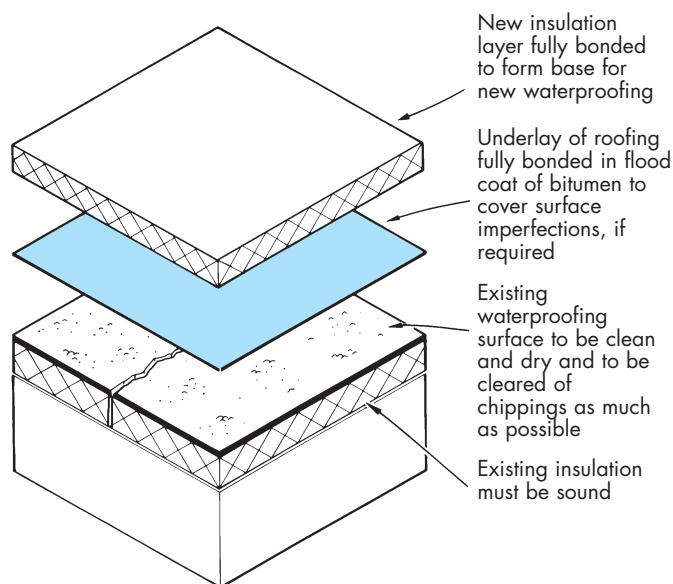
The majority of roofers will choose this option. It provides an independent new waterproofing on a new substrate but avoids the awkward process of stripping away the original work, which could bring great problems of protection during the re-roofing, particularly if the building is to remain occupied.

There is usually enough room for a thin layer of insulation to be added, but the height of skirtings, position of dampcourse, height of kerbs and thresholds should be checked to make sure that the thickness of the new insulation does not rob the skirtings of essential height.

An even thickness of insulation will not change the falls on a roof. If the existing roof has poor falls and drainage with ponded areas, consideration should be given to introducing tapered insulation or crickets so that the new roof can be well drained. Again it is necessary to check that the thickness of insulation does not reduce the height of skirtings and thresholds to unacceptable levels. Most manufacturers of cut to falls insulation will offer a design service for a suitable layout and reference system to ensure correct placing of the tapered insulation on site.

Note that ponding is not necessarily a reason for re-roofing. Most modern membranes will perform well under ponding conditions, but there is no doubt that efficient falls and good drainage are desirable, and if re-roofing is to go ahead it will be an advantage to try to introduce effective falls.

The existing waterproofing is cleared of chippings if



possible, but an advantage of this specification is that the new insulation covers major imperfections in the old surface, including small quantities of chippings which may be hard to remove. The surface should be dry, and a layer of roofing is applied in plenty of bitumen to cover the imperfections and fill up any voids. BS 747 type 3B glass base roofing will be sufficient and it will not only present a satisfactory surface for the application of the insulation, but will turn the old roof into a vapour control layer if one is needed. The new insulation will be fully bonded to this new underlay.

If the surface of the existing membrane is firm and clean and an underlay is not needed to act as a vapour control layer, the insulation may be bonded direct to the existing surface.

The original specification may already contain a vapour control layer, and if this has proved effective there should be no reason to add another. It is possible, however, that leakage may have caused the accumulation of significant amounts of trapped water between the joints of the existing insulation. If the insulation is water resistant, it may remain in good condition and still function efficiently, but it is necessary to ensure that the trapped moisture does not migrate as a vapour through the existing waterproofing to cause harm to the new insulation. A new insulation layer of wood fibreboard or similar moisture sensitive material is most at risk, and should always be applied to an underlay bonded to the original roofing, if there is a likelihood of significant trapped water.

Once the new insulation has been applied, there is a complete new surface for the application of a new waterproofing, which can be built-up roofing or mastic asphalt. The specifications on the insulation will be exactly the same as if the work was new-build, and are given in sections 3.4 and 4.4; typical specifications, which include special references to renewal.

## REPLACEMENT

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### STRIP AND REPLACE EXISTING INSULATION AND WATERPROOFING

A complete strip and relay will be required if the insulation is saturated or degraded, if it is necessary to inspect the roof deck, if the structure will not support the weight of an overlay in addition to the original materials, if the height of upstands limits the depth of extra covering, or if the attachment of existing materials is faulty.

Timber and particleboard decks can be degraded if they become wet from leakage. It is always desirable to strip the existing insulation and waterproofing from these decks so that the deck can be carefully inspected and any degraded sections replaced.

The design and selection of the insulation and membrane should follow exactly the same procedures as for a new roof. It is only necessary to establish the condition of the deck surface after removal of the existing specification and allow for any necessary attention to make it suitable for the re-roofing. Lightweight screeds might be damaged by the stripping, and repair of the surface is likely to be necessary.

It should be remembered that the new insulation and roofing needs to be designed to current standards of moisture control, wind uplift allowances, fire and thermal performance.

Ponding can be corrected by the use of tapered insulation, care being taken to control thickness to ensure skirtings and thresholds remain of sufficient height.

When replacing an old asphalt roof with new asphalt, it is often considered most appropriate to completely strip up the old, and start again as for a new roof.

### STRIP AND REPLACE EXISTING DECK, INSULATION AND WATERPROOFING

The need to replace the structure of a roof will arise only because of the severe deterioration or inadequacy of the roof deck. The design of the insulation and waterproofing specification is as for a new roof, but the form of failure of the original work must be investigated and completely understood to ensure the new design does not repeat the problems of the old. For example, an unventilated cold roof constructed of timber which has failed because of condensation cannot be replaced without either a fundamental change to the ventilation, or a change to a warm roof construction. It is often difficult to tell with such a roof whether the rot arises from leakage or from condensation, and a full investigation of the problem must be carried out.

Note that removal or strengthening of the structure, including the structural deck, may be termed a material improvement in the Building Regulations. In this case the required U-values will apply, but rooflights need not be taken into account, unless they themselves are to be reconstructed.