

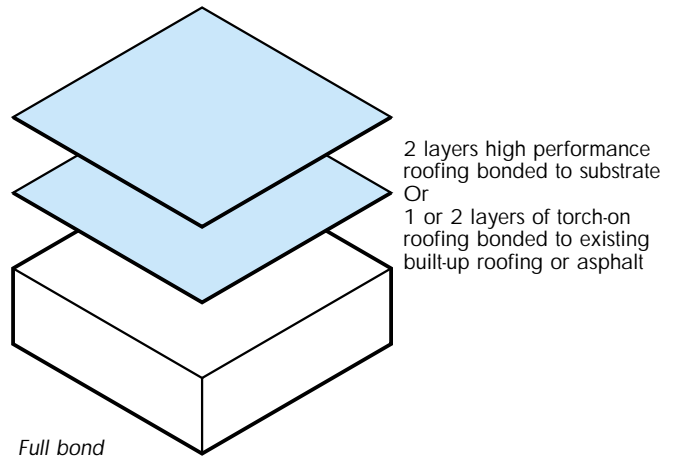
# 3.4 TYPICAL SPECIFICATIONS

## FULLY BONDED SPECIFICATIONS

Use a fully bonded specification on:

- 1 all insulation boards other than rigid urethane and phenolic.
- 2 concrete or cementitious screeds for inverted roof specifications.
- 3 existing built-up roofing or asphalt when one or two layers of torch-on roofing are applied as an overlay.

Fully bonded specifications normally comprise two layers of high performance material, bonded in hot bitumen.



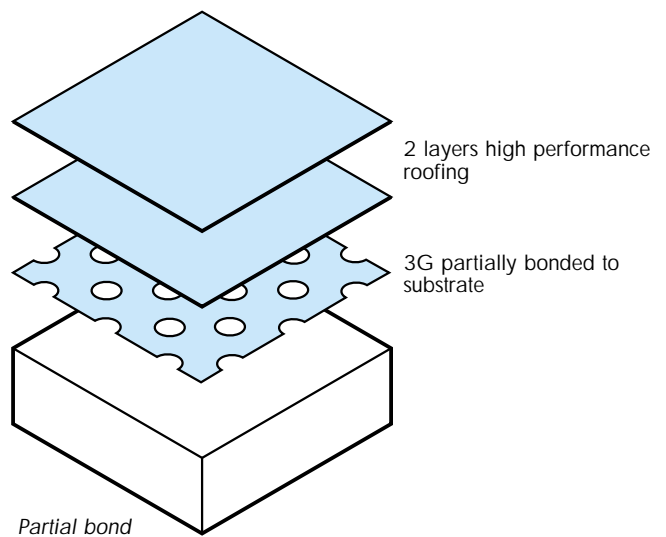
## PARTIALLY BONDED SPECIFICATIONS

Use a partially bonded specification on:

- 1 rigid urethane and phenolic.
- 2 direct to concrete, cement screeds, woodwool, plywood and particleboard.

Part bonded specifications normally comprise three layers of material. The first layer BS 747 type 3G vented base layer, followed by two layers of high performance material.

The first layer, type 3G, forms the essential attachment of the specification, but adds little to waterproofing properties.

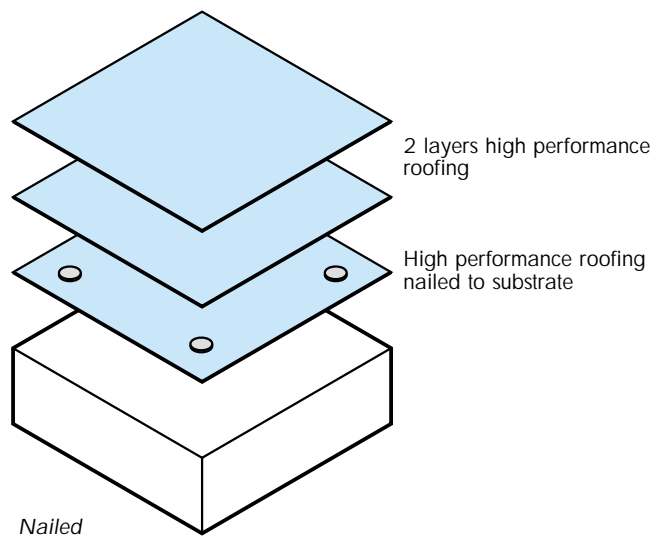


## NAILED SPECIFICATIONS

Use a nailed specification for direct application to a timber boarded deck (cold roof construction).

Nailed specifications normally comprise three layers of material. The first layer high performance nailed, followed by two further layers of material bonded in hot bitumen, to cover the nails and ensure lap security. It is recommended that the second and third layers are high performance material but, as an economy, the second layer could be BS 747 type 3B glass base material.

Nailing centres will be 200mm or 150mm in both directions depending on the design wind loads.



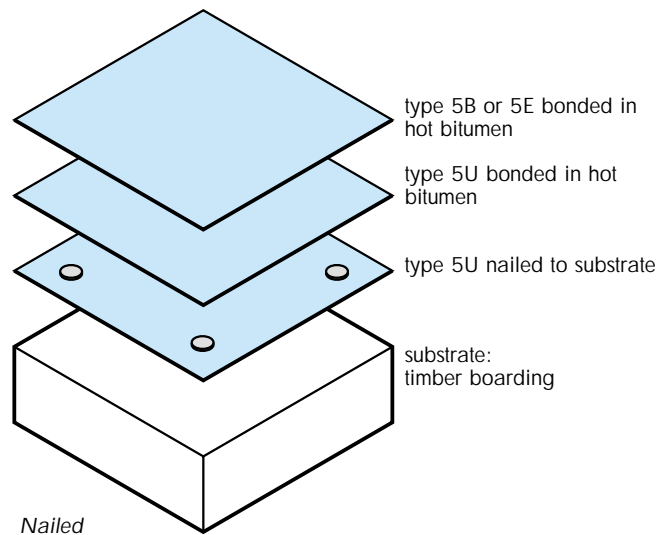
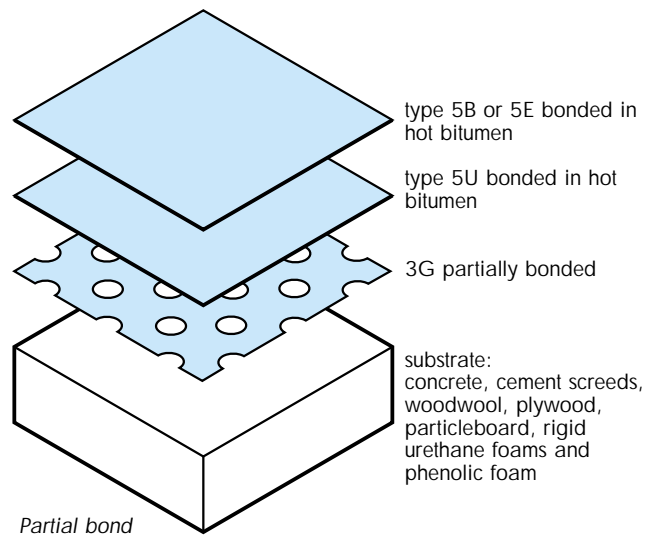
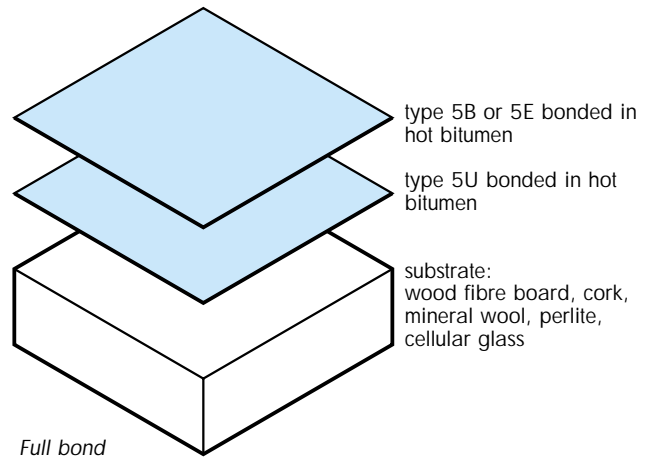
## BS747 TYPE 5 SYSTEM (OXIDISED COATING)

These specifications are used when a specifier requires the materials to conform to a British Standard. They are well proved and provide a reliable specification for all purposes.

BS 747 relates to materials with an oxidised bitumen coating. It does not relate to materials with modified coatings.

Type 5B top layer is a thick material which makes too much thickness at laps to form a level base for tiles or concrete pavings bonded in bitumen.

Type 5U uses a nominal 125g/m<sup>2</sup> polyester base, type 5B and 5E use a nominal 350g/m<sup>2</sup> base.

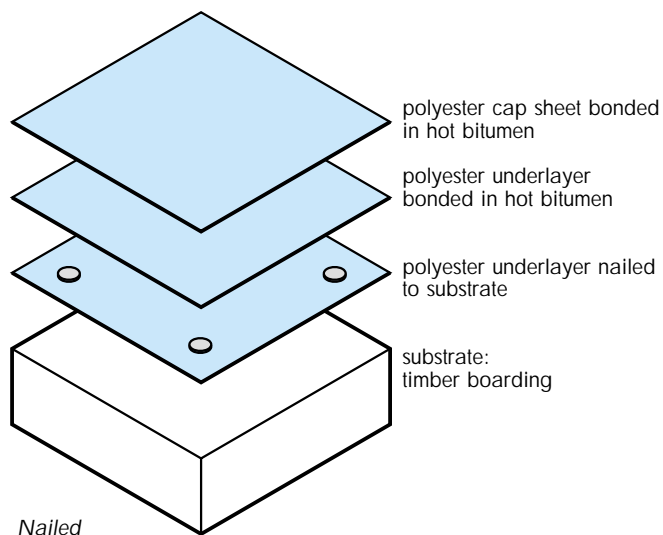
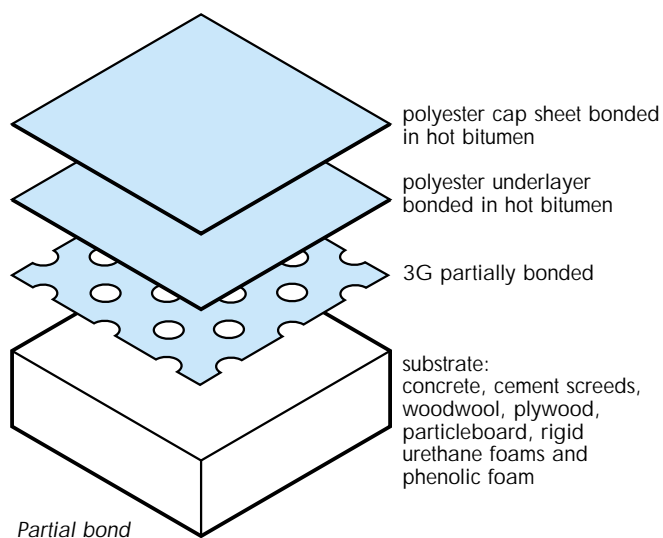
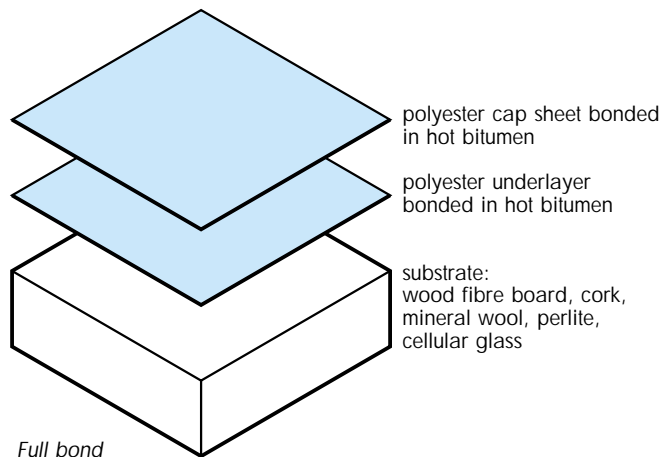


## OTHER OXIDISED OR SBS MODIFIED SYSTEMS

A range of alternative polyester base weights are available other than those complying with BS 747, including 180g/m<sup>2</sup> polyester, 200g/m<sup>2</sup> and 250g/m<sup>2</sup>. These felts together with 350g/m<sup>2</sup> are available with an SBS modified coating.

Specifications using the intermediate weights 180g/m<sup>2</sup>, 200g/m<sup>2</sup> and 250g/m<sup>2</sup> are used to combine a stronger and more stable underlayer, with a top layer which is not so thick as the type 5B and 5E material. These specifications are of roughly equal strength and performance to specifications using BS 747 felt, handle rather better on site, and have less thickness at laps to allow tiles and paving to be bonded to the membrane in hot bitumen.

Specifications using SBS modified coatings are used to gain increased flexibility, particularly in cold weather, and improved handling on site.

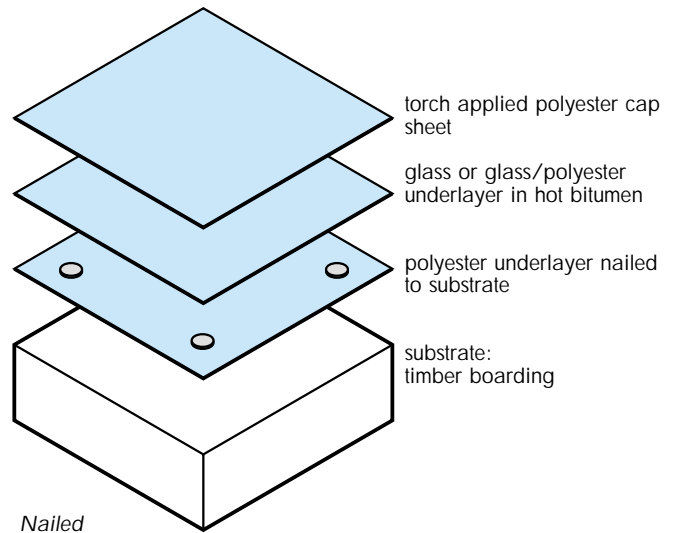
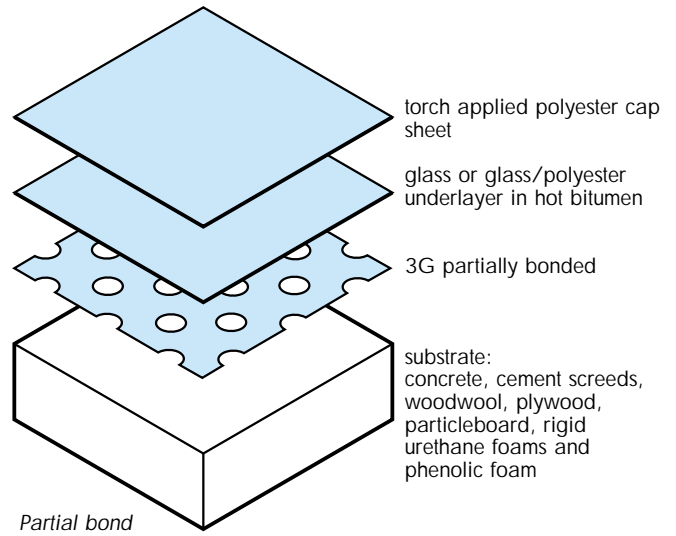
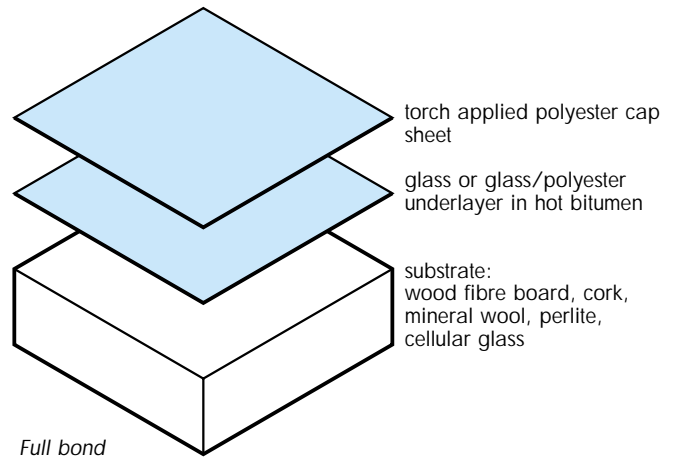


## SBS OR APP TORCH APPLIED CAP SHEETS

When considering a torch applied specification it should be appreciated that there are not many decks or insulations which can safely withstand the naked flame of a gas torch. It is therefore necessary to apply a first layer of glass or glass/polyester based roofing bonded in hot bitumen.

A layer of type 3G roofing is added where a part bond is necessary. An SBS or APP torch applied roofing can then be added as a cap sheet, to make a three layer specification.

A careful appraisal of fire risk is necessary, and a torch-on specification should not be attempted unless it is clear that there are no combustible materials at openings, edges or abutments, and no concealed combustible insulation in cladding systems where work with a gas torch is likely to take place.



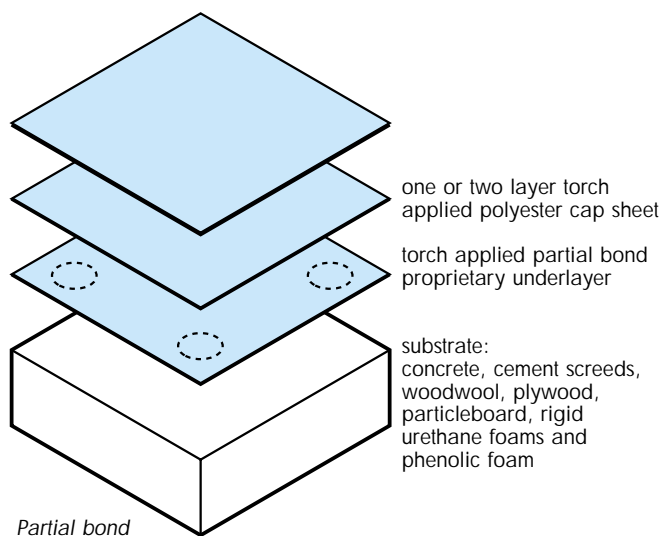
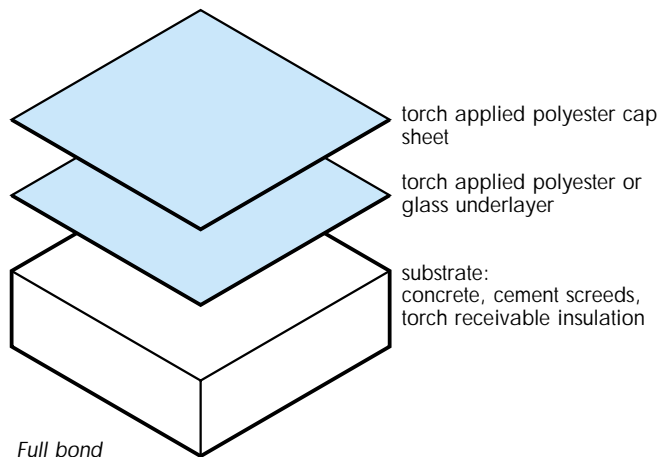
## SBS OR APP TORCH APPLIED IN TWO LAYERS

Direct application of a torch applied material to a deck or insulation is strictly limited to those decks or insulations which are sufficiently incombustible and heat resistant to accept the naked flame of a gas torch without danger or damage.

Concrete decks are safe, and some insulations such as special torching quality mineral wool. It is therefore possible to specify a full torch on specification for these substrates, having checked that no fire risk arises at edges and abutments.

The specification is suitable to form the waterproofing to an inverted roof system. On a concrete deck it is best to fully bond the first layer. The inverted roof system provides good protection to the waterproofing and a part bond is not necessary. The full bond ensures that water will not migrate between the deck and the waterproofing in the event of any damage causing local water penetration. The system is thus very secure, and this is important for buried membranes which are hard to get at for inspection and repair.

Two or three layer torch applied specifications may be part bonded, provided the first attachment layer is specifically designed by the manufacturer for that purpose. Such proprietary systems should be used in accordance with manufacturer's instructions with regard to method of application and acceptable wind loads.



## SBS OR APP SINGLE LAYER TORCH APPLIED

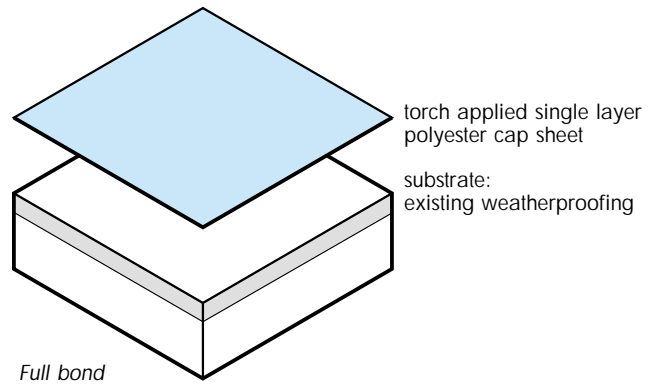
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A common roof renewal system is a single layer of torch applied roofing fully bonded to existing built-up roofing or asphalt roofing to add a new surface, which is effectively a new waterproofing system.

The existing built-up roofing or asphalt must be in reasonably good condition, and all stone chippings must first be removed. The surface should be cleaned and primed before application of the torch applied material.

Both SBS and APP materials are suitable but APP has the advantage of having a coating with a higher melting point. This allows better slip resistance, and is a firmer, more rugged material at high temperatures.

Care must be taken to ensure that no fire risk arises.



## SLOPING ROOFS

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Part bonded specifications using type 3G perforated roofing are not suitable for sloping roofs of 10° pitch or over because of the danger of slipping on loose material during application. The substrate for a sloping roof should be one which is suitable to receive a full bonded specification. If this is not the case it will be necessary to add an additional layer of insulation such as cork or fibreboard to form a suitable surface for full bonding.

Specifications above 5° are nailed at the top of each cap sheet into timber nailing battens which must be included in the detailing of the ridge or top of the slope. Nailing is necessary at 75mm centres in two lines along the top of each cap sheet. This pattern of nailing is cheap and easy to apply, is of prime importance and should not be neglected by the designer or roofer.

When the specification is nailed to prevent slip, it is the shank of the nail which holds the roofing. The head of the nail does not retain a useful grip on the roofing and the number of fixings cannot be reduced by the incorporation of large washers. If screw fixings are used, these again need to be at 75mm centres.

115/15 bitumens should always be used when the slope exceeds 20° and sometimes as an extra precaution on lesser slopes which are exposed to heat trap conditions or when the slope length is considerable. The change of bitumen from the conventional 95/25 bitumen for flat roofing is in addition to nailing.

Polyester felts with a mineral surfaced finish are commonly used as a cap sheet on sloping roofs and are suitable to receive mechanical fixings at the top of the slopes to prevent slip.

Glass based materials cannot be nailed and therefore are not suitable for vertical or sloping work unless the slope is shallow and of no great length.

Metal faced membranes also provide good protection for sloping roofs. Care is needed in the application of these materials. They necessarily become hot during laying and are easily damaged in this condition as the bitumen ceases to provide firm support. Metal faced roofing cannot normally be applied without some creasing and deformation.



## TYPICAL SPECIFICATIONS

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In the following pages, typical built-up roofing specifications are illustrated for the most commonly encountered forms of flat roof construction.

Specifications are grouped according to the structural deck or substrate in the following sequence:

- Concrete and woodwool decks
- Plywood, particleboard and timber decks
- Metal decks
- Roof renewal on existing built-up roofing or asphalt.

The assembly of components is shown for insulated warm roof construction; application direct to deck with no insulation; and inverted roof construction.

The principles described and illustrated for the sequence of components and method of attachment are fundamental to good roofing practice. The advice of a reputable roofing contractor, manufacturer or industry body should be sought if a specification is proposed that changes these principles.



# BUILT-UP ROOFING SPECIFICATIONS

## FULLY BONDED TO CORK, MINERAL WOOL, CELLULAR GLASS, PERLITE OR COMPOSITE INSULATIONS

### BS 747 TYPE 5 FELTS

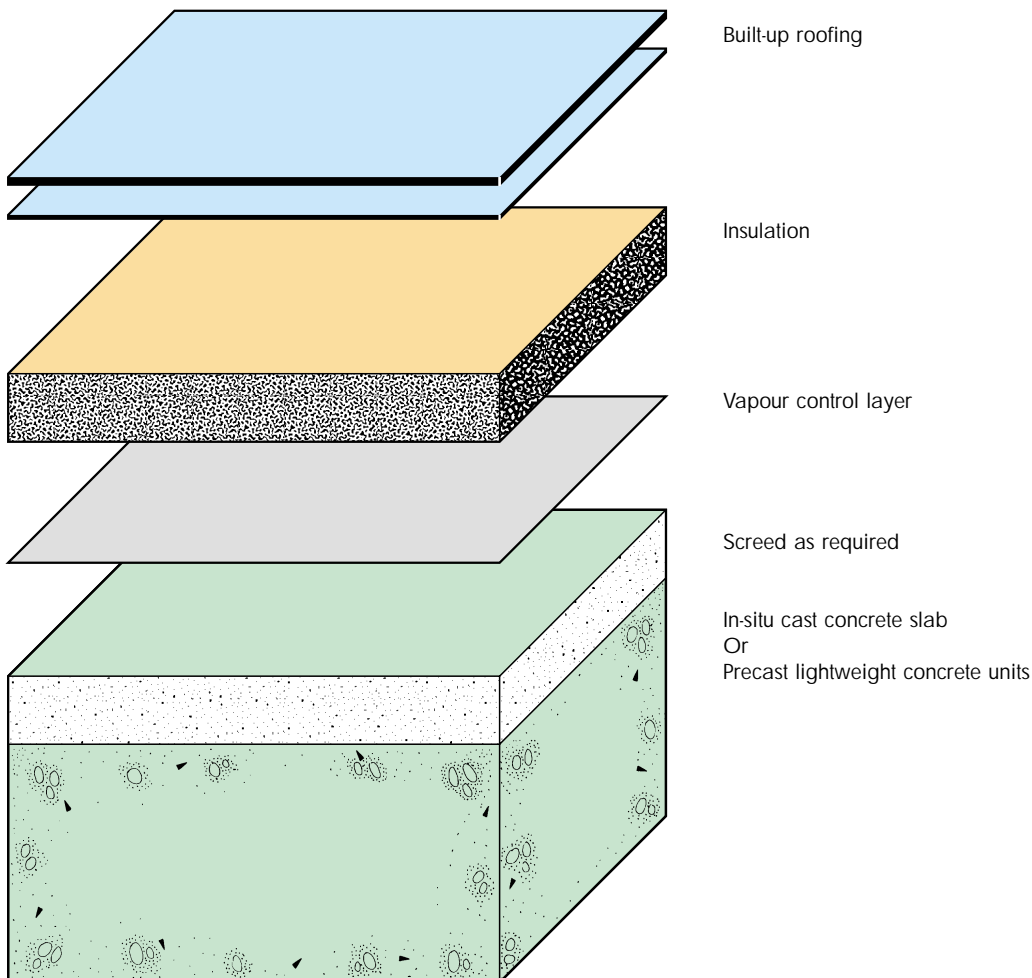
- 2nd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Type 5U polyester based underlayer bonded in bitumen

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 2nd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 2nd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Glass or glass/polyester based underlayer bonded in bitumen



## DECK

### IN-SITU CAST CONCRETE SLAB

A suitable surface of slab or screed for roofing is provided by a wood float finish. Temporary drainage holes should be formed in the structural slab and the deck should be adequately drained and dry before roofing. Apply a bitumen based primer to bind damp or dusty surfaces.

### PRECAST CONCRETE UNITS

Joints between the units may be taped or grouted according to manufacturers' instructions and the deck primed as necessary.

Depending on the accuracy of the manufacture and laying, precast units may require a screed to even out deck irregularities. A screed may also be needed to create falls.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### CONCRETE DECK

#### Vapour barrier

1st Layer: Type 5U or polyester 180 bonded

2nd Layer: Type 3B fully bonded

Or:

One layer polyester or glass based metal lined bitumen roofing.

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

### PRECAST CONCRETE UNITS

#### Vapour barrier

1st Layer: Type 3G partially bonded

2nd Layer: Type 5U or polyester 180 bonded

Or:

1st Layer: Type 3G partially bonded

2nd Layer: One layer polyester or glass based metal lined bitumen roofing

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

## U-VALUES

The following thicknesses of insulation are required to achieve specified U-values for the total roof construction.

### 150mm In-situ cast concrete slab

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Cork board	80	91	106	126	154	196
Mineral wool slab	68	78	91	108	132	168
Cellular glass	85	98	114	135	165	210
Perlite	95	109	127	150	184	234
20mm cork/urethane composite	53	59	67	78	94	117
12mm fibreboard/polystyrene composite	68	78	90	106	129	163

### 100mm Precast lightweight concrete units

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Cork board	58	70	85	105	133	175
Mineral wool slab	50	60	72	90	114	150
Cellular glass	62	74	91	112	142	187
Perlite	69	83	101	124	158	208
20mm cork/urethane composite	41	47	55	66	82	105
12mm fibreboard/polystyrene composite	51	60	72	88	111	145

For composites thickness shown is total thickness of the board

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIALLY BONDED TO RIGID URETHANE OR PHENOLIC INSULATIONS

### BS 747 TYPE 5 FELTS

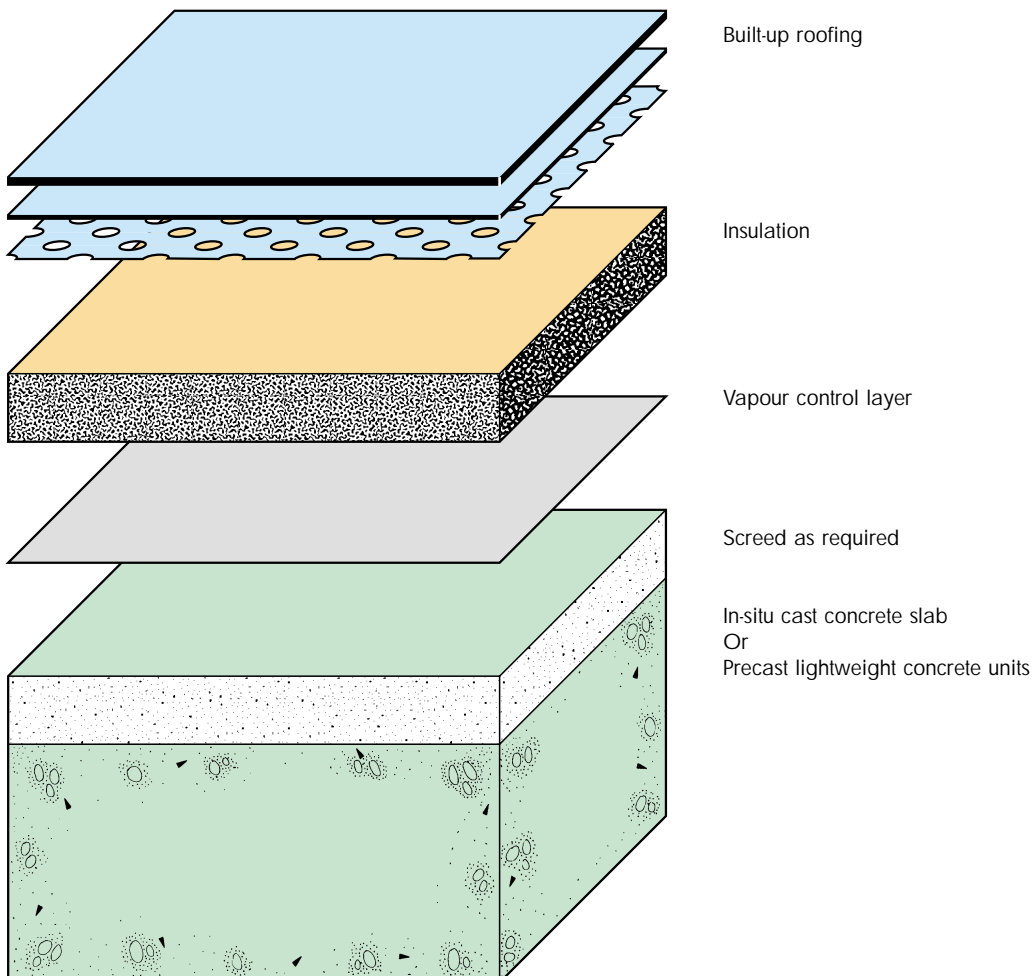
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass /polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded



## DECK

### IN-SITU CAST CONCRETE SLAB

A suitable surface of slab or screed for roofing is provided by a wood float finish. Temporary drainage holes should be formed in the structural slab and the deck should be adequately drained and dry before roofing. Apply a bitumen based primer to bind damp or dusty surfaces.

### PRECAST CONCRETE UNITS

Joints between the units may be taped or grouted according to manufacturers' instructions and the deck primed as necessary.

Depending on the accuracy of the manufacture and laying, precast units may require a screed to even out deck irregularities. A screed may also be needed to create falls.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### CONCRETE DECK

#### Vapour barrier

First layer: Type 5U or polyester 180 bonded  
Second layer: Type 3B fully bonded

Or:

One layer polyester or glass based metal lined bitumen roofing.

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

### PRECAST CONCRETE UNITS

#### Vapour barrier

First layer: Type 3G partially bonded  
Second layer: Type 5U or polyester 180 bonded

Or:

First layer: Type 3G partially bonded  
Second layer: One layer polyester or glass based metal lined bitumen roofing.

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

## U-VALUES

The following thicknesses of insulation are required to achieve specified U-values for the total roof construction.

### 150mm In-situ cast concrete

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Rigid urethane foam	44	50	58	69	84	107
Phenolic foam	38	43	51	60	73	93

### 100mm Precast lightweight concrete units

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Rigid urethane foam	32	38	46	57	73	96
Phenolic foam	28	33	40	50	63	83

# BUILT-UP ROOFING SPECIFICATIONS

## FULLY BONDED TO CORK, MINERAL WOOL, CELLULAR GLASS, PERLITE, OR COMPOSITE INSULATIONS

### BS 747 TYPE 5 FELTS

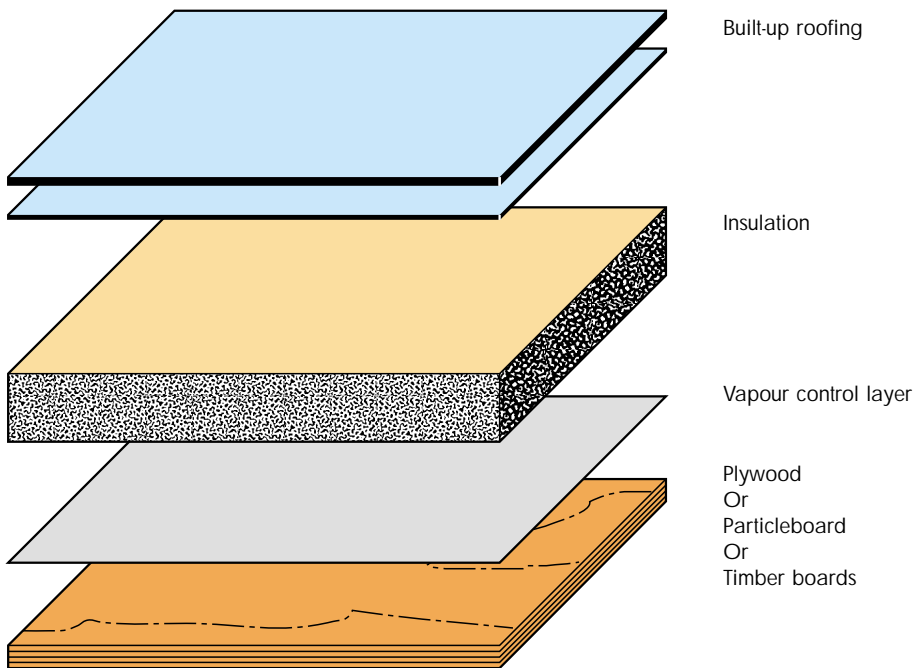
- 2nd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Type 5U polyester based underlayer bonded in bitumen

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 2nd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 2nd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Glass or glass/polyester based underlayer bonded in bitumen



## DECKS

### PLYWOOD

Plywood should be exterior grade type WBP bonded in accordance with BS 6566:Part 8:1985. Panels should be well nailed to timber joists and noggins.

### PARTICLEBOARD

Chipboards should conform to BS 5669:Part 2:1989 types C3, C4 or C5. Panels should be well nailed to timber joists and noggins. The boards should be prefelted, and the joints taped to give temporary waterproofing covering.

Oriented strand board should conform to BS 5669:Part 3:1992 type F1 or F2. Panels should be well nailed to timber joists and noggins.

### TIMBER BOARDS

Timber boards should be well seasoned and not less than 19mm nominal thickness. Tongued and grooved boards are essential with the boards closely clamped and securely nailed.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### PARTICLEBOARD

#### Vapour barrier

Particleboards are not recommended for the high humidity applications which require a vapour barrier

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

### PLYWOOD

#### Vapour barrier

First layer: Type 3G partially bonded

Second layer: Type 5U or polyester 180 bonded

Or:

First layer: Type 3G partially bonded

Second layer: One layer polyester or glass based metal lined bitumen roofing

#### Vapour check

One layer type 3B or 5U or polyester 180 bonded

### TIMBER

#### Vapour barrier

First layer: Type 5U or polyester 180 nailed to deck

Second layer: Type 3B fully bonded

#### Vapour check

Type 5U or polyester 180 nailed to deck

## U-VALUES

The following thicknesses of insulation are required to achieve specified U-values for the total roof construction.

### 19mm plywood, particleboard or timber

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Cork board	78	90	105	125	153	195
Mineral wool slab	67	77	90	107	131	167
Cellular glass	84	97	113	134	164	209
Perlite	93	107	125	149	182	232
20mm cork/urethane composite	52	58	67	78	93	116
12mm fibreboard/polystyrene composite	67	77	89	105	128	162

For composites thickness shown is total thickness of the board

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIALLY BONDED TO RIGID URETHANE AND PHENOLIC INSULATIONS

### BS 747 TYPE 5 FELTS

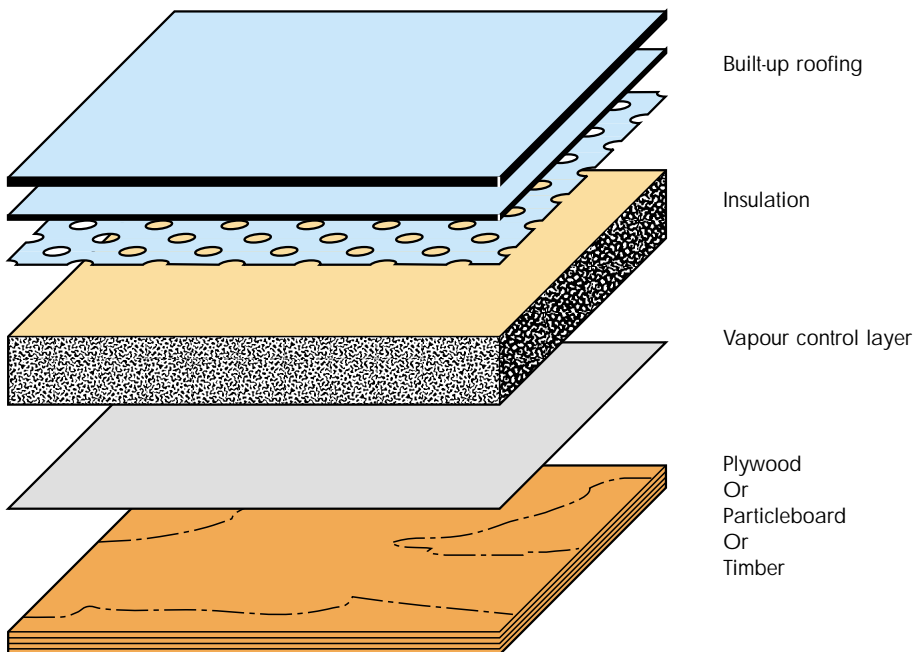
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded



## DECKS

### PLYWOOD

Plywood should be exterior grade type WBP bonded in accordance with BS 6566:Part 8:1985. Panels should be well nailed to timber joists and noggins.

### PARTICLEBOARD

Chipboards should conform to BS 5669:Part 2:1989 types C3, C4 or C5. Panels should be well nailed to timber joists and noggins. The boards should be prefelted, and the joints taped to give temporary waterproofing covering.

Oriented strand board should conform to BS 5669:Part 3:1992 type F1 or F2. Panels should be well nailed to timber joists and noggins.

### TIMBER BOARDS

Timber boards should be well seasoned and not less than 19mm nominal thickness. Tongued and grooved boards are essential with the boards closely clamped and securely nailed.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### PARTICLEBOARD

#### *Vapour barrier*

Particleboards are not recommended for the high humidity applications which require a vapour barrier

#### *Vapour check*

One layer type 3B or 5U or polyester 180 bonded

### PLYWOOD

#### *Vapour barrier*

First layer: Type 3G partially bonded

Second layer: Type 5U or polyester 180 bonded

Or:

First layer: Type 3G partially bonded

Second layer: One layer polyester or glass based metal lined bitumen roofing

#### *Vapour check*

One layer type 3B or 5U or polyester 180 bonded

### TIMBER

#### *Vapour barrier*

First layer: Type 5U or polyester 180 nailed to deck

Second layer: Type 3B fully bonded

#### *Vapour check*

Type 5U or polyester 180 nailed to deck

## U-VALUES

The following thicknesses of insulation are required to achieve specified U-values for the total roof construction.

### 19mm plywood, particleboard or timber

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Rigid urethane foam	43	49	58	68	84	107
Phenolic foam	37	43	50	60	73	93

# BUILT-UP ROOFING SPECIFICATIONS

## FULLY BONDED TO CORK, MINERAL WOOL, CELLULAR GLASS, PERLITE OR COMPOSITE INSULATIONS

### BS 747 TYPE 5 FELTS

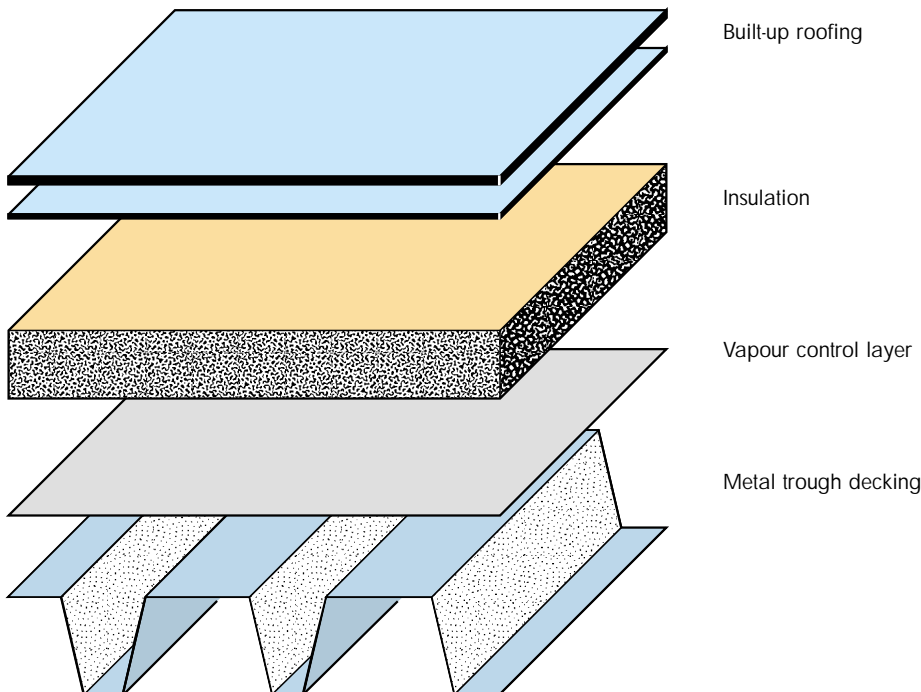
- 2nd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen  
Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive  
1st Layer Type 5U polyester based underlayer bonded in bitumen

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 2nd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)  
Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive  
1st Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 2nd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)  
Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive  
1st Layer Glass or glass/polyester based underlayer bonded in bitumen



## DECK

Metal deck is usually fixed by a specialist contractor as part of a single responsibility roofing operation comprising deck, thermal insulation and waterproofing.

The load bearing performance of steel decks should be calculated in accordance with BS 5959:Part 6: 1995.

For high humidity applications, aluminium decks are normally recommended. If steel decks are used under these conditions, a protective coating to both sides of the deck should be specified.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### *Vapour barrier*

First layer: Type 5U or polyester 180 bonded to deck flats

Second layer: Type 3B fully bonded

Or

One layer metal lined polyester bitumen roofing. Side and end laps fully sealed. All laps supported on the flats of deck or additional sheet metal strips

### *Vapour check*

One layer Type 5U or polyester 180 bonded to deck flats

## U-VALUES

The following thickness of insulation are required to achieve specified U-values for the total roof construction.

Metal decks

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Cork board	80	92	107	127	155	197
Mineral wool slab	69	79	92	109	133	169
Cellular glass	86	99	115	136	166	211
Perlite	96	110	127	151	185	235
20mm cork/urethane composite	53	59	68	79	94	117
12mm fibreboard/polystyrene composite	69	78	90	107	129	163

*For composites thickness shown is total thickness of the board*

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIAL BONDED TO RIGID URETHANE OR PHENOLIC INSULATIONS

### BS 747 TYPE 5 FELTS

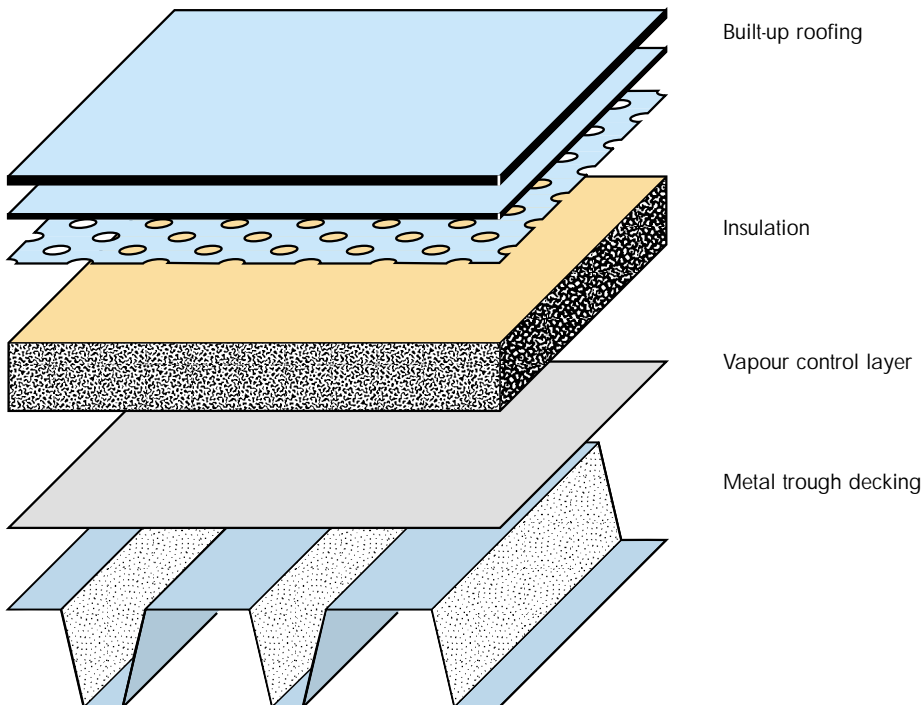
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded



## DECK

Metal deck is usually fixed by a specialist contractor as part of a single responsibility roofing operation comprising deck, thermal insulation and waterproofing.

The load bearing performance of steel decks should be calculated in accordance with BS 5959:Part 6: 1995.

For high humidity applications, aluminium decks are normally recommended. If steel decks are used under these conditions, a protective coating to both sides of the deck should be specified.

## VAPOUR CONTROL LAYER

The requirement for a vapour control layer should be assessed in accordance with BS 6229:1982.

### *Vapour barrier*

First layer: Type 5U or polyester 180 bonded to deck flats

Second layer: Type 3B fully bonded

Or

One layer metal lined polyester bitumen roofing. Side and end laps fully sealed. All laps supported on the flats of deck or additional sheet metal strips.

### *Vapour check*

One layer Type 5U or polyester 180 bonded to deck flats

## U-VALUES

The following thickness of insulation are required to achieve specified U-values for the total roof construction.

Metal deck

Insulation	U-value W/m <sup>2</sup> K					
	0.45	0.4	0.35	0.3	0.25	0.2
Rigid urethane foam	44	50	59	70	85	108
Phenolic foam	38	44	51	60	74	94

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIALLY BONDED DIRECT TO PLYWOOD OR PARTICLEBOARD

### BS 747 TYPE 5 FELTS

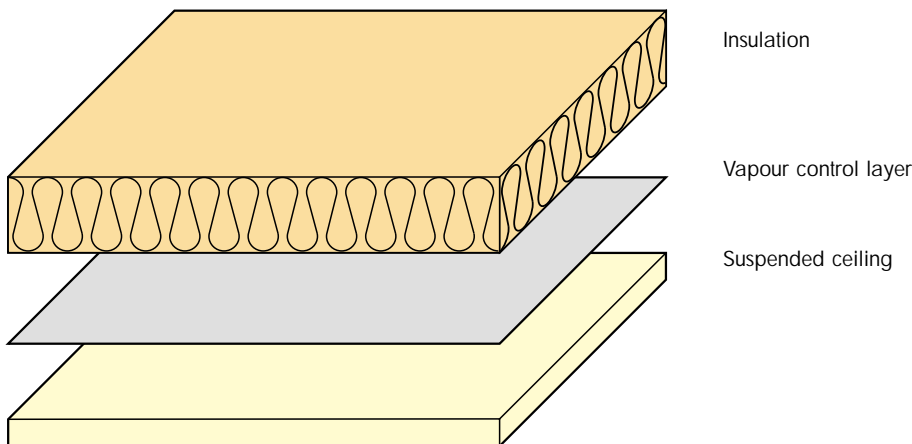
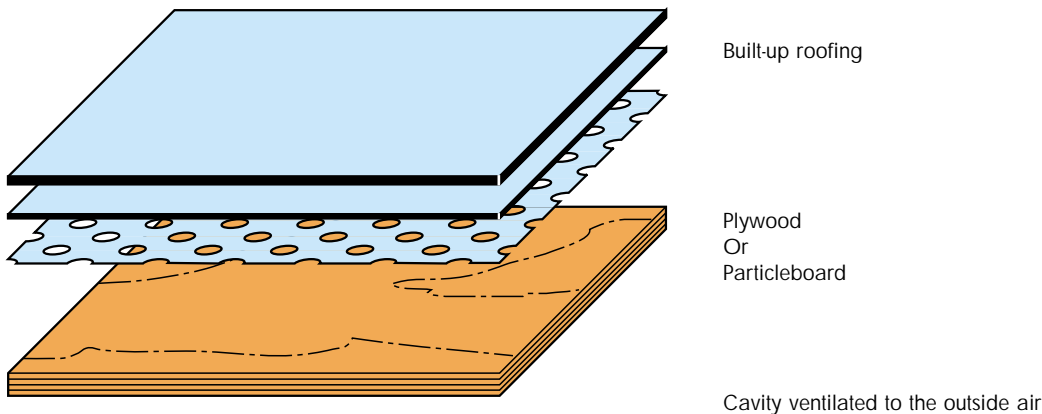
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded



## DECKS

### PLYWOOD

Plywood should be exterior grade type WBP bonded in accordance with BS 6566:Part 8:1985. Panels should be well nailed to timber joists and noggins.

### PARTICLEBOARD

Chipboards should conform to BS 5669:Part 2:1989 types C3, C4 or C5. Panels should be well nailed to timber joists and noggins. The boards should be prefelted, and the joints taped to give temporary waterproofing covering.

Oriented strand board should conform to BS 5669:Part 3:1992 type F1 or F2. Panels should be well nailed to timber joists and noggins.

## THERMAL DESIGN

To reduce the risk of condensation the cavity space formed should be ventilated in accordance with current Building Regulations.

If cavity ventilation is restricted then it is advisable to change the design to a warm roof construction.

# BUILT-UP ROOFING SPECIFICATIONS

## NAILED TO TIMBER DECK

### BS 747 TYPE 5 FELTS

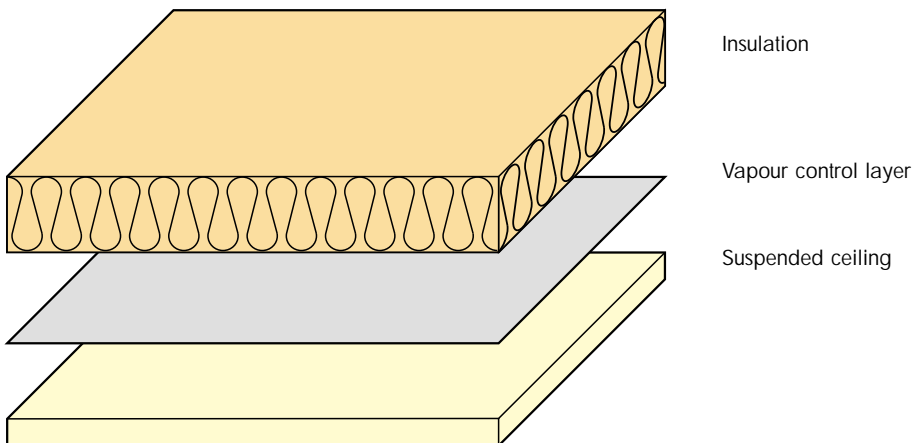
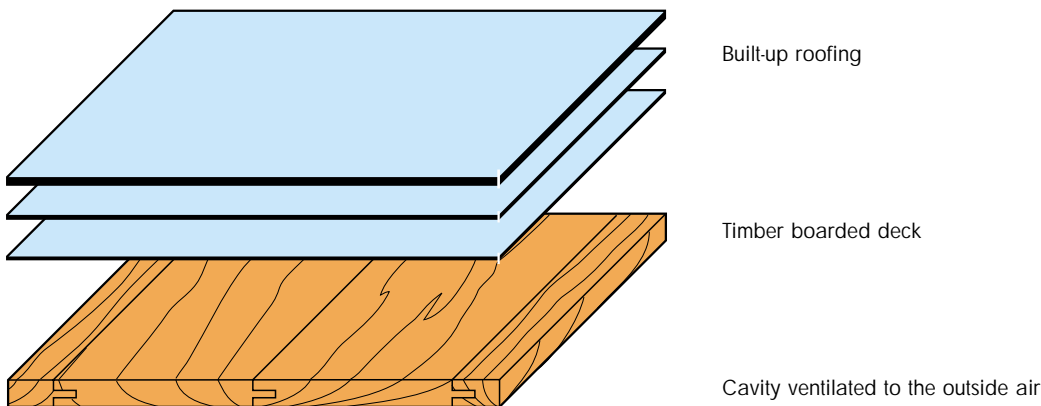
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 5U polyester based underlayer nailed

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Polyester based underlayer nailed (base weight 125g/m<sup>2</sup> to 180g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester based underlayer bonded in bitumen
- 1st Layer Polyester based underlayer nailed (base weight 125g/m<sup>2</sup> to 180g/m<sup>2</sup>)



## DECKS

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Timber boards should be well seasoned and not less than 19mm nominal thickness. Tongued and grooved boards are essential with the boards closely clamped and securely nailed.

## THERMAL DESIGN

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To reduce the risk of condensation the cavity space formed should be ventilated in accordance with current Building Regulations.

If cavity ventilation is restricted then it is advisable to change the design to a warm roof construction.

# BUILT-UP ROOFING SPECIFICATIONS

## FULLY BONDED TO CONCRETE DECK

### BS 747 TYPE 5 FELTS

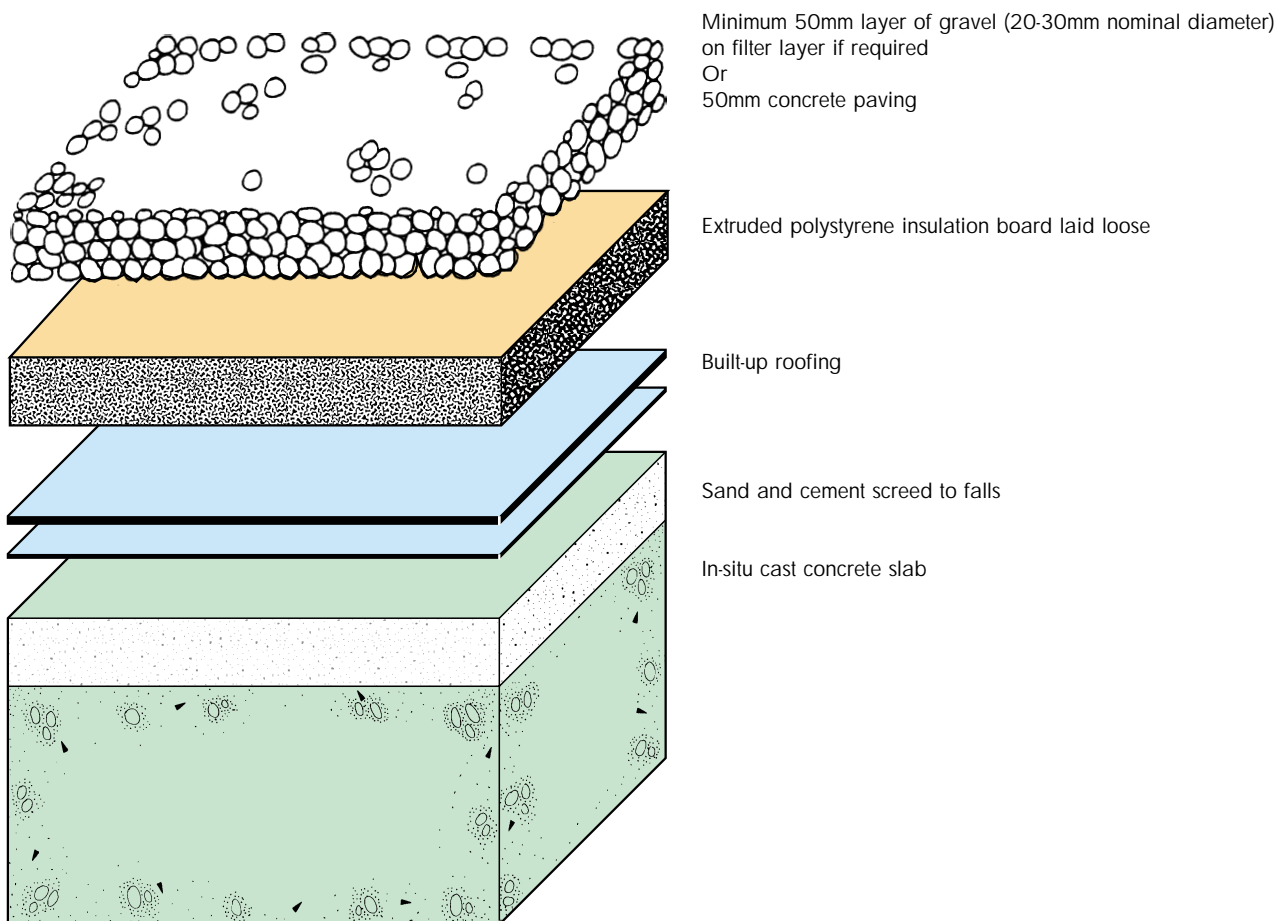
- 2nd Layer Type 5B polyester base top layer bonded in bitumen
- 1st Layer Type 5U polyester based underlayer bonded in bitumen

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 2nd Layer Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- 1st Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 2nd Layer Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- 1st Layer Polyester based underlayer torch applied (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)



## DECKS

A suitable surface of slab or screed for roofing is provided by a wood float finish. Temporary drainage holes should be formed in the structural slab and the deck should be adequately drained and dry before roofing. Apply a bitumen based primer to bind damp or dusty surfaces.

## U-VALUES

When calculating board thickness to achieve a specific U-value, it is necessary to allow for the loss of efficiency once the board is installed due to the effect of rainwater draining under the insulation.

It is normal to add 20% to the thickness of the insulation to take this into account.

Standard thicknesses of insulation board provide the following U-values ( $W/m^2K$ ) for the total roof construction.

### 150mm In-situ concrete slab

Thickness of insulation mm				
50	75	90	100	120
0.56	0.39	0.33	0.30	0.26

# BUILT-UP ROOFING SPECIFICATIONS

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## SINGLE LAYER TORCH APPLIED TO EXISTING BUILT-UP ROOFING OR ASPHALT

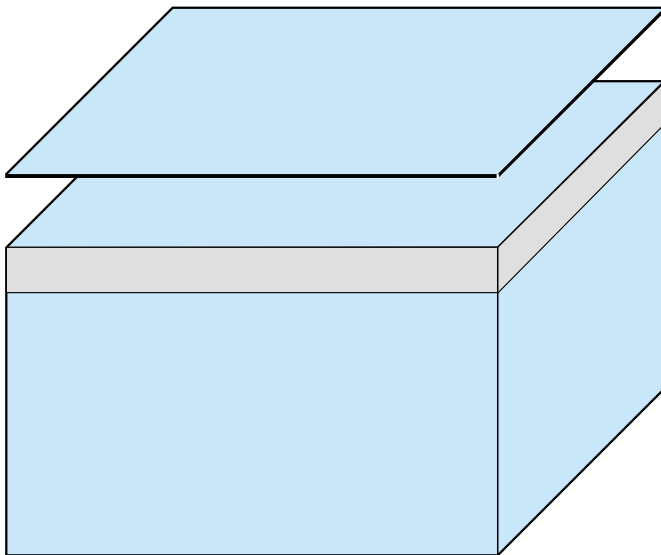
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### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)

Or

Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive



Single layer torch applied

Existing built-up roofing  
Or  
Existing asphalt

## PREPARATION

The existing structure must be sound and any insulation above the deck should be dry, wet insulation should be replaced. The waterproofing should be basically sound, rot free and not saturated with water and any stone chipping surfacing removed. An application of primer will normally be necessary to bind the surface and ensure good adhesion.

## FIRE PRECAUTIONS

The roof and surrounding construction should be inspected to ensure that there is no risk of fire. It is necessary to take into account the deck, walls, rooflights and particularly any concealed insulation in wall cladding and skirtings.

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIALLY BONDED TO EXISTING BUILT-UP ROOFING OR ASPHALT

### BS 747 TYPE 5 FELTS

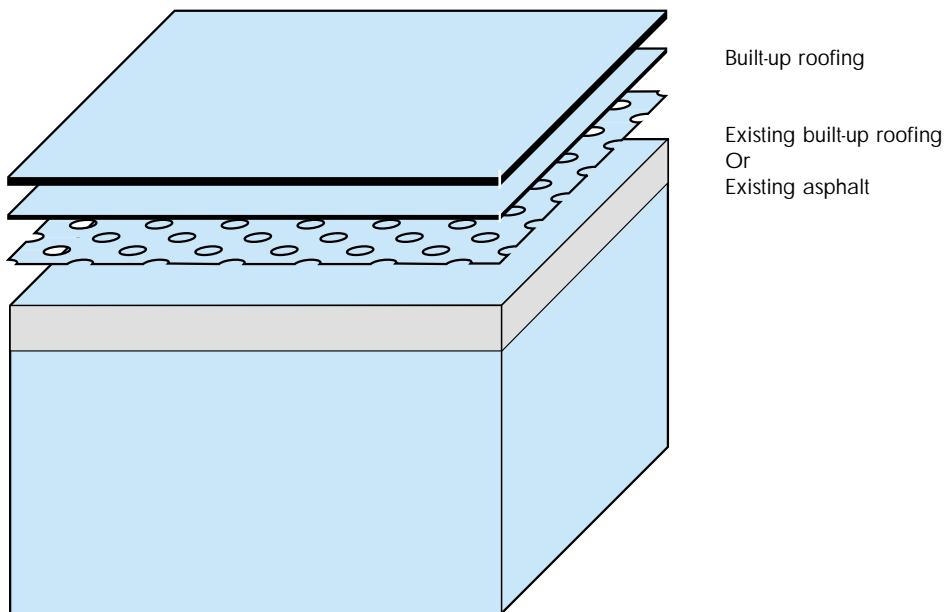
- 3rd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen
- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded



## PREPARATION

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The existing structure must be sound and any insulation above the deck should be dry, wet insulation should be replaced. The waterproofing should be basically sound, rot free and not saturated with water and any stone chipping surfacing removed. An application of primer may be necessary to bind the surface and ensure good adhesion.

# BUILT-UP ROOFING SPECIFICATIONS

## FULLY BONDED TO CORK, MINERAL WOOL, CELLULAR GLASS, PERLITE OR COMPOSITE INSULATIONS ON EXISTING BUILT-UP ROOFING OR ASPHALT

### BS 747 TYPE 5 FELTS

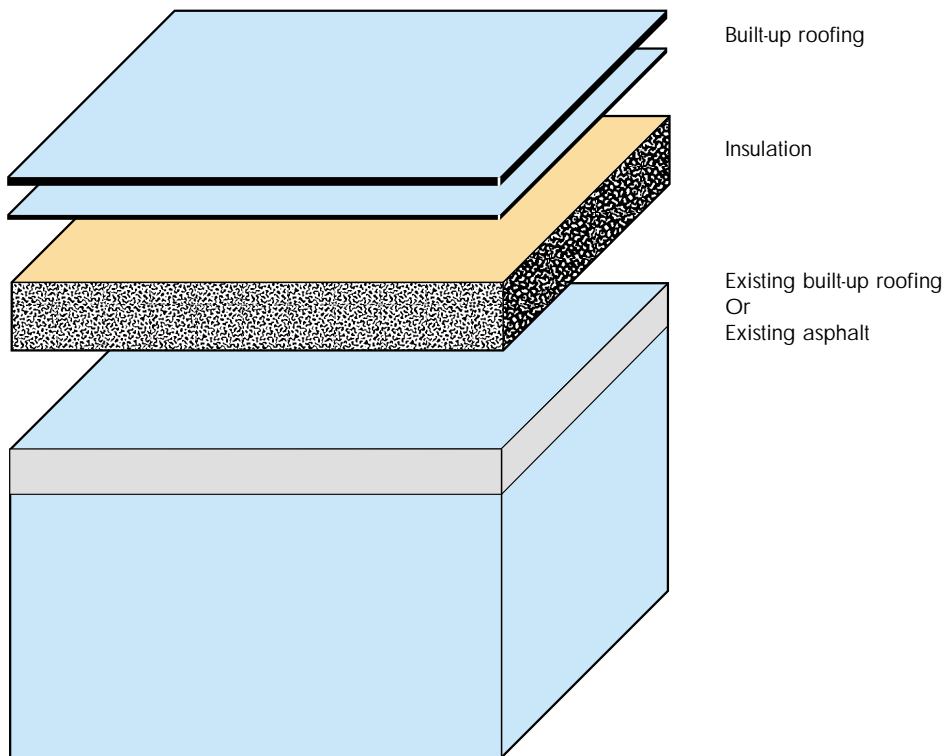
- 2nd Layer Type 5E polyester base mineral surfaced cap sheet bonded in bitumen  
Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Type 5U polyester based underlayer bonded in bitumen

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 2nd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)  
Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 2nd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)  
Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 1st Layer Glass or glass/polyester based underlayer bonded in bitumen



## PREPARATION

The existing structure must be sound and any insulation above the deck should be dry, wet insulation should be replaced. The waterproofing should be basically sound, rot free and not saturated with water and any stone chipping surfacing removed. Where this is not possible, a layer of type 3B or similar may be bedded in hot bitumen to give a suitable surface to accept the insulation.

## THERMAL INSULATION

The insulation will not only isolate the new waterproofing from the existing, but will also improve the overall insulation of the roof. The U-value of the total construction will depend on the type and thickness of insulation in the existing construction as well as the new insulation.

Tapered insulation can be introduced to improve drainage.

# BUILT-UP ROOFING SPECIFICATIONS

## PARTIALLY BONDED TO RIGID URETHANE OR PHENOLIC INSULATIONS ON EXISTING BUILT-UP ROOFING OR ASPHALT

### BS 747 TYPE 5 FELTS

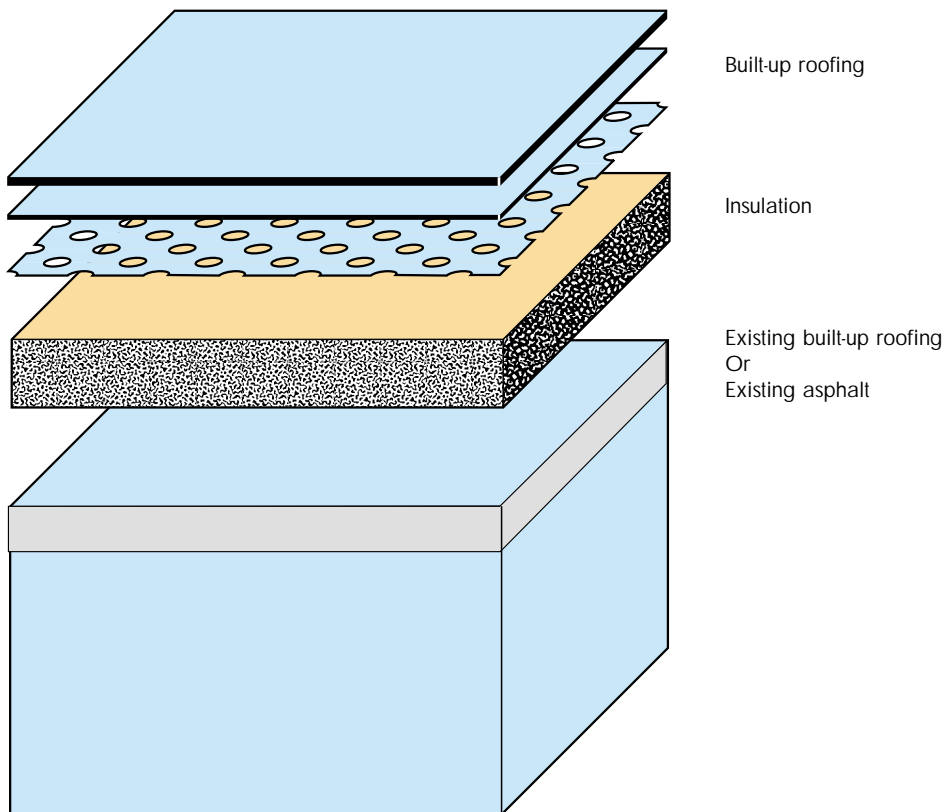
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- Or Type 5B polyester base top layer bonded in bitumen surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Type 5U polyester based underlayer bonded in bitumen
- 1st Layer Type 3G venting base layer partially bonded

### OXIDISED OR SBS MODIFIED BITUMEN COATED FELTS BONDED IN HOT BITUMEN

- 3rd Layer Polyester base mineral surfaced cap sheet bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer bonded in bitumen (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Polyester based underlayer bonded in bitumen (base weight 180g/m<sup>2</sup> to 250g/m<sup>2</sup>)
- 1st Layer Type 3G venting base layer partially bonded

### SBS OR APP MODIFIED BITUMEN COATED FELTS TORCH APPLIED

- 3rd Layer Polyester base mineral surfaced cap sheet torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>)
- Or Polyester base top layer torch applied (base weight 180g/m<sup>2</sup> to 350g/m<sup>2</sup>) surfaced with stone chippings bedded in bitumen based adhesive
- 2nd Layer Glass or glass/polyester based underlayer bonded in bitumen
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## PREPARATION

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The insulation will not only isolate the new waterproofing from the existing, but will also improve the overall insulation of the roof. The U-value of the total construction will depend on the type and thickness of insulation in the existing construction as well as the new insulation.

Tapered insulation can be introduced to improve drainage.