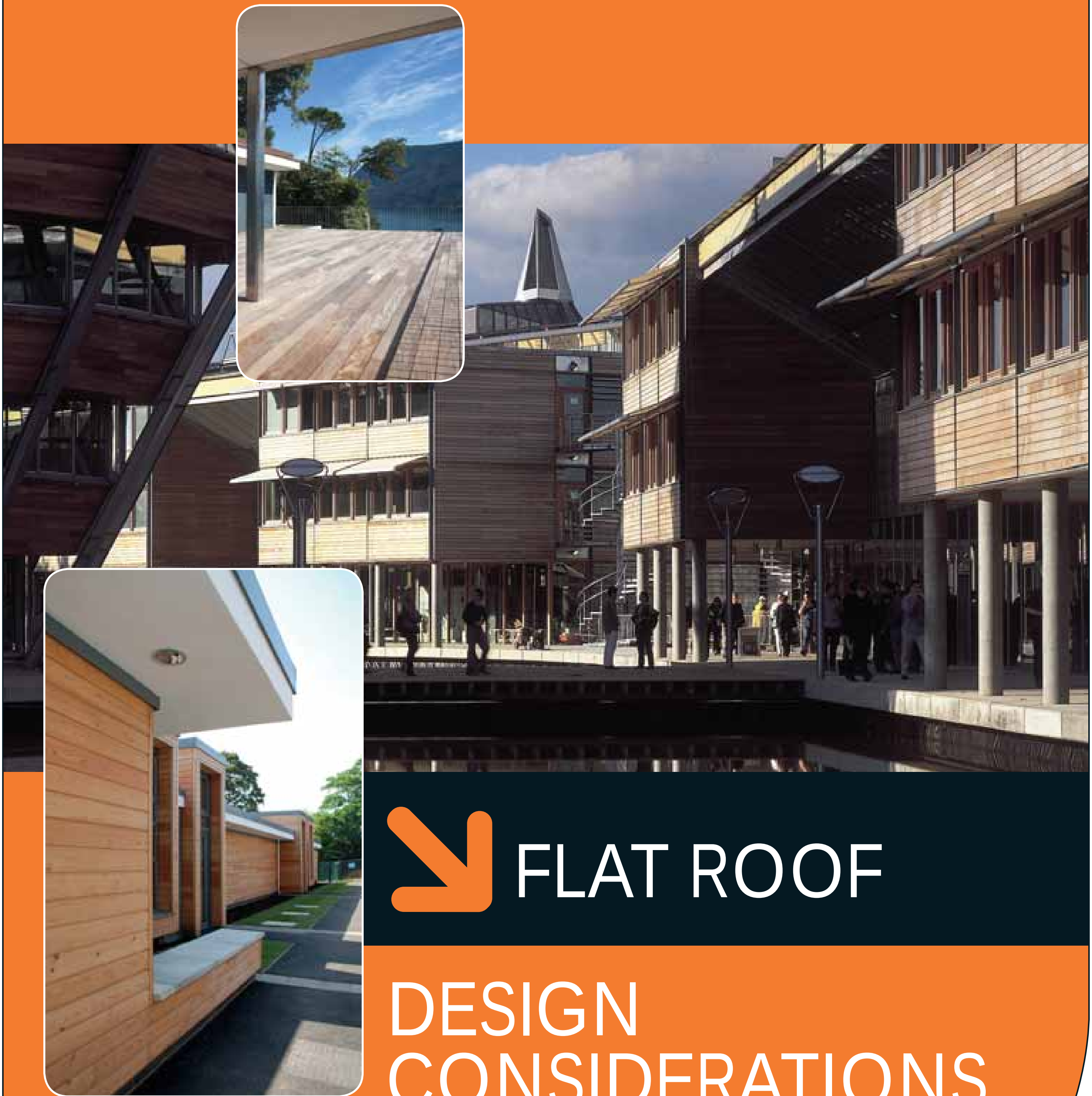
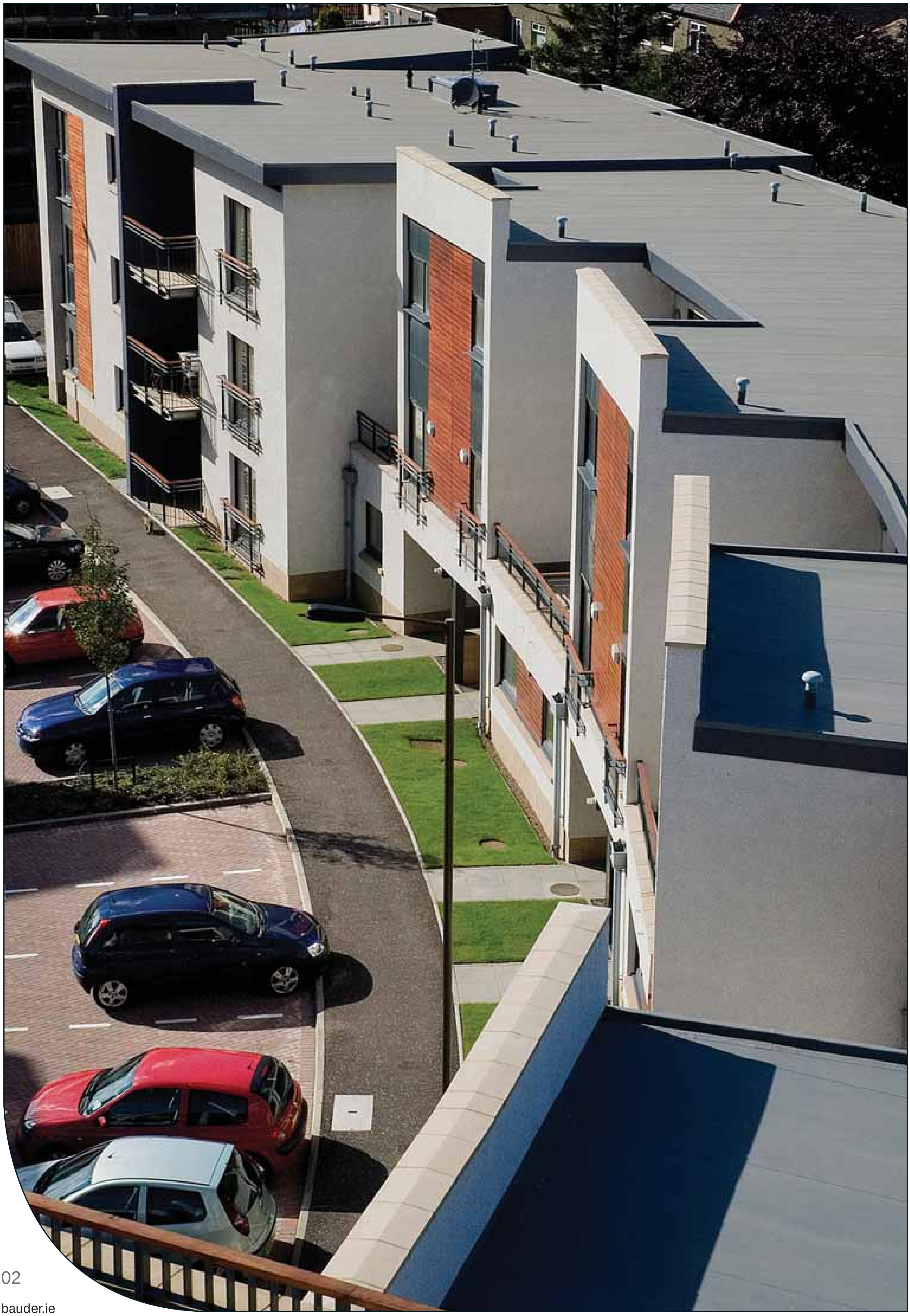
BAUDER



FLAT ROOF

DESIGN CONSIDERATIONS



CONTENTS

1 FLAT ROOF CONSTRUCTION TYPES

Thermal Design

Thermal design is concerned with the flow of both heat and water vapour through the roof construction and their subsequent effect on the performance of the roof and the various components in the system. The designer therefore needs to consider the amount of insulation required to control both heat loss and condensation.

In the case of a flat roof, insulation is usually in the form of either a rigid board above the deck, or a fibrous quilt immediately above the ceiling, depending on the type of roof construction.

There are three recognised designs of flat roof construction; warm, cold and inverted.

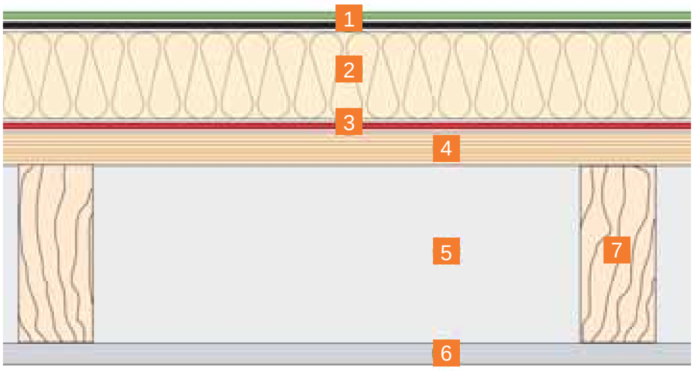
Manchester University

Warm Roof

In a warm roof construction the principal thermal insulation layer is located above the structural decking, resulting in the structural deck and support structure being at a temperature close to that of the interior of the building. It is necessary to incorporate a vapour control layer beneath the insulation in order to prevent moisture vapour being forced into the insulation through thermal pressure from within the building. The waterproofing membranes are placed over the insulation to completely encapsulate it.

There is no requirement for roof void ventilation, and cold bridging through the system is easier to eliminate because there are no interruptions from the structural supports as there is in a cold roof construction.

Although this type of construction is normally continuously supported, it can also provide a flat and stable structure directly over most profiled metal decking and is generally recommended for all flat roof applications due to the simplicity of its design.



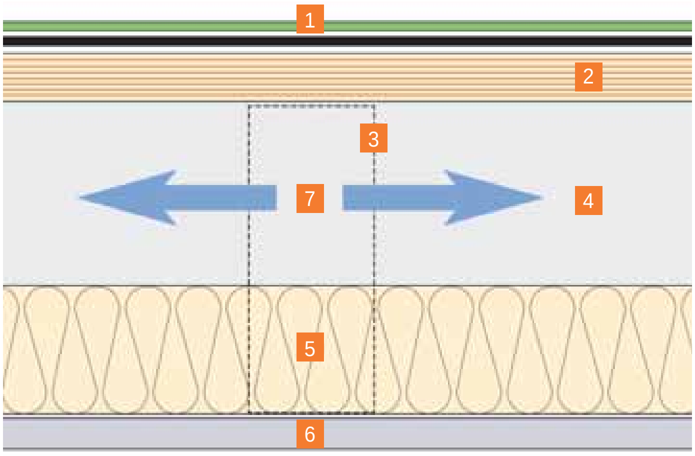
1. **Waterproofing**
2. **Rigid Insulation**
3. **Vapour Control Layer**
4. **Structural Deck (e.g. plywood)**
5. **Roof Void**
6. **Ceiling**
7. **Support Structure**

Cold Roof

In cold roof construction, the principal thermal insulation layer is located below the structural decking. The concept for this type of design is usually associated with roof constructions having independent ceilings to support the insulation. Adequate ventilation must be provided between the insulation and the underside of the roof deck to prevent the risk of interstitial condensation forming within the construction.

A cold roof design is not generally recommended for new build flat roof applications due to the added requirement for roof void ventilation and the difficulties in preventing cold bridging through the system.

If an existing cold roof is to be refurbished, consideration should be given to converting the design to a warm roof, or incorporating new insulation into the roofing system to improve thermal performance. However, if the latter is the case, thermal calculations will be required in order to analyse the likelihood of condensation formation.



1. Waterproofing

2. Structural Deck (e.g. plywood)

3. Support Structure

4. Ventilated Ceiling Void

5. Quilt Insulation

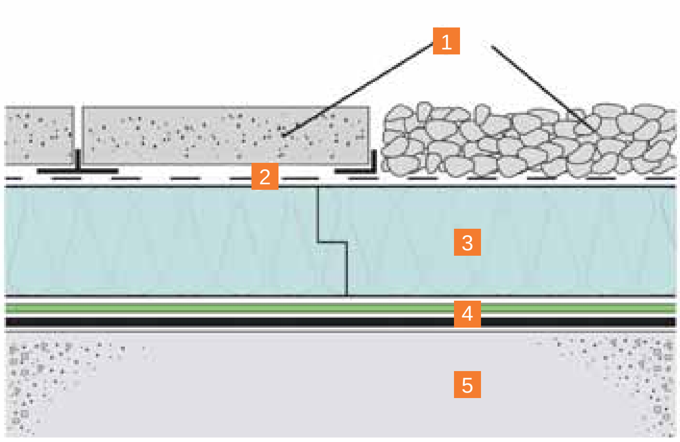
6. Ceiling

7. Cross Ventilation

Inverted Roof (Upside Down Roof)

In an inverted roof construction, the principal thermal insulation layer is located not only above the roof structure but also above the waterproofing, resulting in the waterproofing, structural deck and support structure being at a temperature close to that of the interior of the building. No vapour control layer is required.

This type of construction is generally only used for flat roof applications to concrete support structures due to the weight loading of the ballast that becomes necessary to restrain the insulation against wind uplift and flotation.



1. Surfacing / Ballast (e.g. paving or pebbles)

2. Filtration Layer / Vapour Permeable Membrane

3. Inverted Roof Insulation Boards (e.g. extruded polystyrene)

4. Waterproofing System

5. Structural Deck (e.g. concrete)

2 INSULATION & CONDENSATION

Thermal Design

Insulation

The designer should determine the type of insulation required for the construction by consideration of the factors listed below:

- Required thermal performance ('U' value) of the roof.
- The build-up thickness that can be accommodated at roof level.
- Imposed weight loading to the deck structure.
- Compressive strength required (the ability of the insulation to withstand loads applied directly onto the roof system surface).
- The level and type of traffic that the roof will experience both during and after construction.
- Compatibility with other roofing components.
- Required fire resistance.
- Required acoustic performance.
- Environmental properties.

Bauder manufactures rigid urethane foam insulation products for use within Bauder warm roof systems to provide a totally compatible system. This product has been specifically chosen for the benefits it provides, however, we are able to provide certain other insulation materials as part of the system should this be considered preferable. When inverted design is required, we can provide Bauder XPS or BauderJFRI insulation along with their associated Vapour Permeable Membrane.

Condensation

The temperature at which air becomes fully saturated with moisture (100% RH) is called the dew point. When warm moist air meets a cold surface it is cooled, and if its temperature drops below the dew point it will give up moisture in the form of surface condensation.

The air within a building normally contains more water vapour than the external air and so therefore has a higher vapour pressure. This creates a vapour drive from the areas of high pressure to areas of low pressure and water vapour will try to escape by all available routes to the low pressure conditions outside the building.

Moisture vapour is also present in all the permeable materials of a building, including the roof construction, and as the vapour pressure inside a building is continually changing, there is a constant flow of water vapour in and out of the roofing materials.

In cold weather the temperature under the waterproofing will fall and can create a zone in the roof structure where the temperatures are below the dew point. Moisture will condense in this zone to form interstitial condensation.

The incorporation of adequate insulation and ventilation in the roof void of a cold roof construction, or sufficient insulation and vapour barrier in a warm roof construction, will prevent the formation of interstitial condensation in the normal range of environmental conditions experienced.

The Bauder Technical Services Team is always available for free 'U' value and condensation risk calculations, or for advice on any particular project.

Building Regulations

Minimum levels of insulation required in flat roof constructions is governed by Building Regulations. These levels are rising on an ever increasing scale as the Government strives to meet its targets for reducing CO_2 emissions. Along with increased insulation levels is a requirement for attention to construction details in order to reduce thermal bridging and air leakage where the various elements of a building meet. Guidance on detail design is given by 'Accredited Construction Details' which is available from **www.planningportal.gov.uk**

Materials used for the roof deck should be selected from those listed in the latest version of BS 6229:2003. It is important to refer to this document for design guidance, but, for convenience, the various materials are outlined below:

Reinforced Concrete

Suitable for all Bauder waterproofing systems, this includes both in-situ and pre-cast forms, which can be covered with a cementitious screed if required. The surface should be wood float finished and the slab allowed to cure thoroughly and dry out to provide a suitable surface to which the membranes can be applied.

Profiled Metal

Metal decking constructed to support built-up waterproofing systems should be of a suitable profile, i.e. featuring crowns that are wider than the respective troughs. The trough span should not exceed 150mm, otherwise the vapour barrier may sag at the laps and adequate support will not be provided for the insulation.

Suitably profiled decking is available in either aluminium or galvanised steel, however consideration should be given to the fact that many systems are applied using intense heat, in which case aluminium is best avoided as it is more likely to distort at high temperatures. Similarly, plastic or painted soffit types of decking may become damaged by the heat used when installing torch-applied membranes. This type of decking is not suitable for cold roof design unless it is subsequently overlaid with plywood or OSB.

Timber Boarding

Timber boarding suitable for roof decks should be a minimum 19mm nominal thickness, planed and closely clamped together, tongued and grooved or closely butted. When using this type of deck in conjunction with bonded vapour barriers, it will be necessary to first install a random nailed isolating layer prior to the installation of the main roofing system to cover the joints between adjacent boards. This decking is not suitable for hot melt or cold liquid applied systems.

Specification Support

Specification downloads:
www.bauder.co.uk/technical-centre

Telephone helpline:
0845 271 8800

Plywood

Plywood used for roof decks is generally 18 mm thick, but it is possible to specify a minimum 15 mm if the supporting structure is more closely spaced. The plywood is normally square-edged. Longitudinal joints should occur on the centre line of supporting joists. Cross joints should be staggered and will require additional support, e.g. by noggins. A joint gap of 1 mm per metre of panel should be allowed at all edges. The plywood should comply with BS EN1995 to be suitable for structural use. Materials suitable for flat roofing would be marked BS EN 636-2 or BS EN 636-3 and must be suitable for exterior use. Plywood is suitable for all Bauder waterproofing systems.

Oriented Strand Board (OSB)

OSB used for flat roof decking should be type OSB/3 or OSB/4, conforming to BS EN 300:1997. Thickness and fixing recommendations are similar to those for plywood. Suitable for use with all Bauder systems.

Woodwool Slabs

When using this type of decking, slabs must conform to BS EN 13168 and be at least 50mm thick. They should have a pre-screeded top surface and have channel reinforced sides. Please note that this type of decking is now classed as 'fragile' in the UK and therefore not recommended by Bauder for new build construction.

Wood Particle Board (Chipboard)

This type of deck is no longer recommended for use in flat roof applications due to its long term structural instability, especially if contaminated by moisture.

4 FIRE PERFORMANCE

The current position

In the UK, the hazard that exists of fire spreading to the roof of a building from a nearby fire outside the building itself is covered under Building Regulations 'Fire Safety - Approved Document B' and uses BS 476: Part 3 2004 -'External Fire Exposure Roof Test' to assess representative systems of the roof construction (not individual comprising components) in their response to fire from outside the building. The test is not concerned with the behaviour of roofs when subjected to the effects of fire from its underside, i.e. from within the building.

The test covers two primary elements; the penetration of flame would give an A - D evaluation, and the surface spread of flame which would also be classified on an A - D score to produce a two letter code to identify the final rating. This rating would then signify whether the system could be used anywhere on the roof if it achieved an AA, AB or AC classification and therefore deemed 'unrestricted'. If, however, the system should achieve any other rating this would be regarded as 'restricted' and not be utilised within at least 6, 12 or 20 metres of the boundary (depending on the two letter classification) as they do not provide adequate protection against the spread of flame through or over them.

Each classification letter represents a different result :

First Letter - Fire Penetration Classification

A Those specimens which have not been penetrated within 1 hour.
B Those specimens which are penetrated in not less than 30 minutes.
C Those specimens which are penetrated in less than 30 minutes.
D Those specimens which are penetrated in the preliminary flame test.

Second Letter - Spread of Flame Classification

A Those specimens on which there is no spread of flame.
B Those specimens on which there is not more than 533mm, spread of flame.
C Those specimens on which there is more than 533mm, spread of flame.
D Those specimens which continue to burn for 5 minutes after the removal of the test flame or with spread of flame more than 381mm, in the preliminary test.

European Fire Standards

To advance and clarify the fire standards across Europe for External Fire Performance the industry has been going through a changeover from the test and classification of BS476-3:2004 to the tests of ENV1187 and classification using BS EN 13501-5. The standardisation into one European test proved indefinable as many countries within the EU had differing regulations and so four test standards were required to cover the legislation in place within the various member states at the time. As such the ENV1187 has four tests for roof covering systems: t1 for Germany, t2 for Scandinavia, t3 for France and t4 for the UK.

The results from testing under ENV1187 with BS EN 13501-5 are given as European Class ratings Broof(t4), Croof(t4), Droof(t4), Eroof(t4) and Froof(t4) and can be related to the longstanding BS 476 two letter ratings as follows:

National Class	European Class	Minimum distance from any point on relevant boundary
AA, AB or **AC**	Broof(t4)	Unrestricted and can be used anywhere on the roof
BA, BB or **BC**	Croof(t4)	At least 6m of the boundary
CA, CB or **CC**	Droof(t4)	At least 6, 12 or 20m of the boundary depending on the building type and use
AD, BD or **CD**	Eroof(t4)	At least 6, 12 or 20m of the boundary depending on the building type and use
DA, DB, DC or **DD**	Froof(t4)	At least 20m of the boundary depending on the building type and use

Separate Fire Standards apply to wall cladding

Specification Support

Specification downloads:
www.bauder.co.uk/technical-centre

Telephone helpline:
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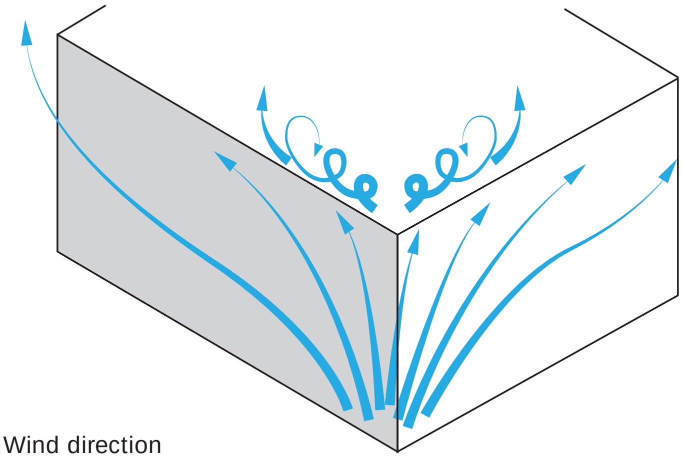
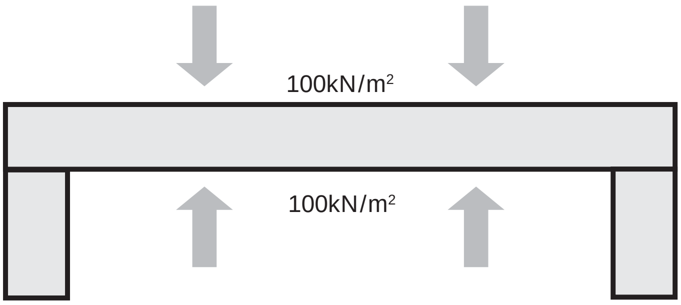
WIND LOAD DESIGN 5

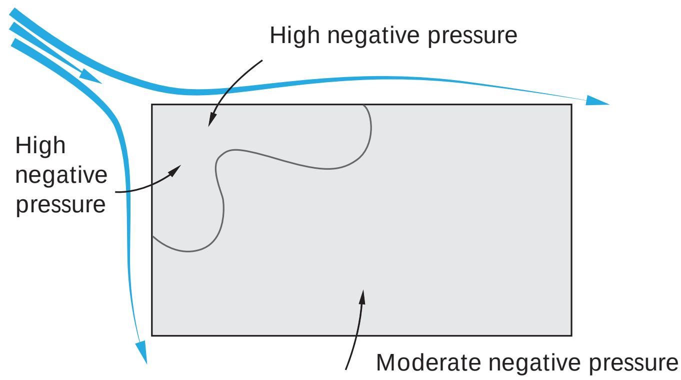
When wind strikes a building it is deflected to generate a positive pressure on the windward face. As it accelerates around the side of the building and over the roof it creates a reduced or negative pressure in its trail.

The greatest pressures are experienced at the windward corners and edges of the roof, where the negative pressure exerted on the roof can be several times that experienced in the central areas.

Bauder Technical Department can provide Wind Load Calculations on request in accordance with the UK National Annex to Eurocode 1 - Actions on structures Part 1 - 4: General actions - Wind actions (BS EN 1991 - 1 - 4.







The Critical Layer

When there is no wind, the air pressure on the upper surface of a roof system is the same as that on the underside. Wind changes this equilibrium by reducing the atmospheric pressure on the surface of the roof system. The atmospheric pressure acting on the underside of the roof will remain the same or may be increased if windows or doors are open on the windward side of the building. The result is a net upward push acting on the underside of the roof.

This upward thrust will be exerted on the lowest air impermeable layer in the roof construction, which will be required to stop air flowing further into the system. In most roof constructions there is one layer that provides the dominant barrier against the upward thrusting flow of air and this is referred to as the critical layer.

In roof constructions where the deck is continuous (e.g. screeded concrete) it will be deemed to be the critical layer, but for air permeable decks (i.e. those with joints) the critical layer will occur somewhere in the roof system itself.

In the case of bituminous membrane systems where the deck is permeable, the critical layer will be the vapour barrier (in a warm roof construction) or the underlayer (in a cold or inverted roof). When these membranes are properly installed, the bond achieved will be far stronger than the loading imposed by wind uplift.

In the case of refurbishment overlays, the critical layer will be the existing roof system and its suitability to perform adequately will need to be given careful consideration.

Single ply membranes can be restrained against wind up lift by either being mechanically fastened or adhered, both methods of attachment provide effective resistance to wind uplift forces. Both hot melt and cold liquid applied systems are fully bonded to the deck and wind uplift is not considered to be a problem.

Inverted Roofs

With an inverted roof specification, the insulation is laid loose and its security will be provided by a loading coat, typically gravel ballast or paving slabs.

Edge Detailing

Damage caused to flat roofs during severe gales usually starts at exposed windward corners and edges. It is therefore important to make sure that fascias, cappings, trims, and drips are adequately fixed. As a rough guide trims should be screw fixed at 250 mm centres with extra fixings added under conditions of extreme exposure.

6 FALLS & DRAINAGE

It is a requirement of Building Regulation Part H that adequate provision is made for rainwater to be carried from the roof of the building.

It is generally considered good practice for flat roofs to be designed to clear surface water as rapidly as possible. According to BS6229 & BS8217, flat roofs should be designed with minimum falls of 1:40 to ensure a finished fall of 1:80 can be achieved, allowing for any inaccuracies in the construction.

Water ponding on membrane roofs should be avoided because:

1. It encourages the deposition of dirt and leaves which can be unsightly, may obstruct outlets and /or become a slip hazard.
2. In the event of damage, the interior may suffer greater water ingress.
3. It increases the dead load and may cause progressive deflection of the deck.
4. Ice may be a slip or wind hazard during the winter months.
5. Roofs with extensive ponding require increased maintenance input.

Although all Bauder systems are capable of withstanding ponding water for long periods of time, their ultimate life expectancy will undoubtedly be affected.
Falls in the structure can be achieved by adjusting the height of the supporting beams or purlins, by using tapered supports, or by the addition of firring pieces before the deck is laid. In the case of a cast in-situ concrete slab, falls are normally provided by use of a screed.

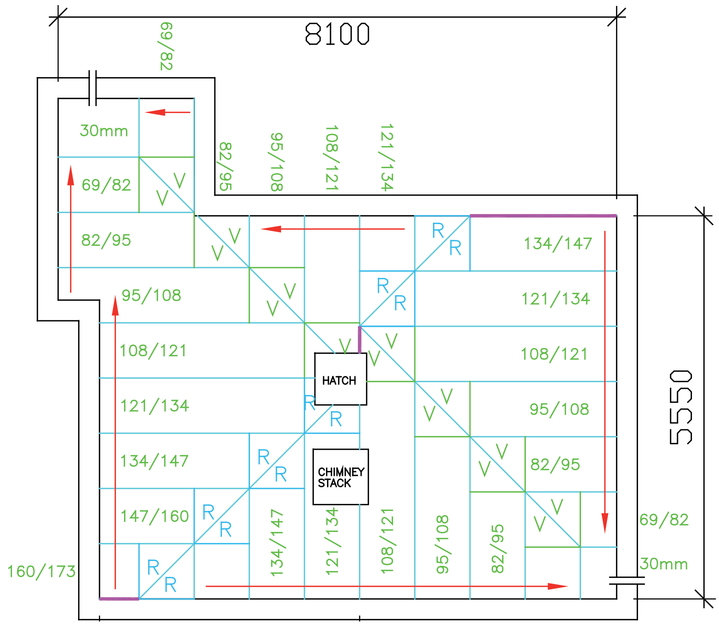
Tapered insulation systems are a lightweight, convenient and cost effective alternative method of providing falls to the roof and can be used with our reinforced bitumen membrane (RBM) and synthetic single ply roof systems.

Our Technical Department can design bespoke insulation schemes for individual projects and provide advice on roof fall design.

Drainage

Drainage needs to be provided via internal rainwater outlets and downpipes or via external guttering systems or hoppers. Even if a roof is very small, it is recommended there are at least two drainage points in case one becomes blocked. Internal gutters linking internal outlet positions should be at least 500mm wide.

BS EN 12056-3 and the Building Regulations Approved Document Part H contain relevant design information to enable rainfall calculations to be undertaken and give design principles for gutters and downpipes. Alternatively, most drainage component manufacturers will make recommendations regarding the type, size and location of their products for any given roof project.



Typical Bauder Tapered Insulation Scheme

LOCATING EQUIPMENT 7

Locating Equipment on the Roof

From an integrity point of view, it is far better to site equipment directly onto a finished waterproofing system, as the less interruptions or penetrations to the membranes, the less likely the system is to allow water ingress. Plant is typically supported by paving slabs with a suitable protection layer beneath.

Most Bauder warm roof systems (i.e. those using PIR insulation) are capable of supporting permanently sited plant with a weight of up to 2000 kg/m², avoiding the need for penetrations through the waterproofing.

If the plant is either too heavy for the waterproofing to support, or requires fixing down to the structure, then it will be necessary to introduce a support system that can be easily waterproofed. For example, hollow section beams should be used in preference to section beams, and the larger the section, the easier it is to waterproof. Additionally, any fixings used should be of the flush head design to allow successful waterproofing.

Another satisfactory way to provide support to plant is to cast concrete plinths, which can be waterproofed with Bauder membranes and capped with leadwork. Note the cable tray system employed in this picture, supported by proprietary free-standing adjustable feet with loose laid pieces of capsheet beneath, to provide protection to the waterproofing.

Rooftop equipment mounted on a steel framework fixed to an adjacent wall is an excellent solution. It allows any future work required to the roof to be carried out without interfering with the plant.

Walkways

Whenever there is a requirement for regular foot traffic across a roof, for example to provide maintenance to rooftop plant or a fire escape route, it will be necessary to provide protection to the surface of the waterproofing.

It is normally sufficient to provide an extra layer of capping sheet in a contrasting colour to denote the walkway and provide sufficient protection. In cases of extreme traffic, promenade tiles can be bonded to the surface of the capping sheet using hot bitumen or a suitable cold applied adhesive.

8 SAFE ACCESS

All flat roofs will have a requirement for a certain amount of pedestrian access, whether this is for maintenance of the roof and any rooftop plant or as a fire escape route. It is therefore necessary to design any flat roof to allow for safe access.

Careful design can eliminate hazards and make the risks associated with roof access easier to manage. Under the CDM Regulations, designers have a duty to ensure that their designs give adequate regard to health and safety. Foreseeable risks should be avoided. If it is not reasonably practicable to avoid them, they should be combated at source. Priority should be given to design solutions providing general rather than individual protection. *For example:*

1. **Eliminate unprotected fragile materials.**
2. **Minimise inspection and maintenance requirements for the completed roof structure.**
3. **Consider carefully the siting of plant which will require maintenance. Are there alternatives to placing it on the roof? If not, is it in the optimum position provided?**
4. **When incorporating rooflights, always specify 'non-fragile' and consider carefully their location.**
5. **Provide clear and unambiguous specifications for safety critical elements of the design.**
6. **Provide information relevant to maintenance for inclusion in the Health and Safety file.**

Rooflights

Where rooflights are used the following should be considered*:*

1. **The specification of rooflights that are 'non-fragile'.**
2. **Specifying rooflights that project above the plane of the roof and which cannot be walked on.**
3. **Specifying rooflights with a design life that matches that of the roof.**

Bauder supply rooflights for use in conjunction with our systems that are classified 'non-fragile'. These rooflights are guaranteed for the same duration as the roof system that they accompany.

Access to flat roofs is often simple and because they are flat it is easy to walk around on them. Accidents happen not just to roof workers but also to engineers, surveyors, children, and caretakers etc. The first priority is to design out the risk at source; for example, by specifying adequate inbuilt edge protection. Designers should consider the alternatives available in terms of their effectiveness in preventing falls, as well as cost, aesthetics and buildability.

▲ Edge protection provided by free-standing handrail system

Edge Protection

The options for edge protection in order of effectiveness are:

1. **Designed parapet**
2. **Guard rail at the roof edge**
3. **Permanent protected walkway for access to plant on the roof**
4. **Preformed sockets to support temporary edge protection guard rails**
5. **Running line systems designed, installed and tested to the relevant standards**

The following factors should be taken into consideration when undertaking the refurbishment of an existing flat roof system:

Condition and Nature of the Existing Deck

The first thing to examine when considering a refurbishment of a flat roof is the condition of the deck and supporting structure. If this is at all questionable, a structural survey should be commissioned.

Generally speaking, decks made from chipboard or strawboard should always be replaced as their lifespan is limited and any water ingress that may have occurred will have reduced their load bearing strength. These products would normally be replaced with a suitable grade plywood or OSB. Metal decks should be checked for signs of corrosion and deflection; and concrete for cracks and movement. Woodwool is now classed as a fragile material and should be treated in accordance with the latest Health and Safety guidelines.

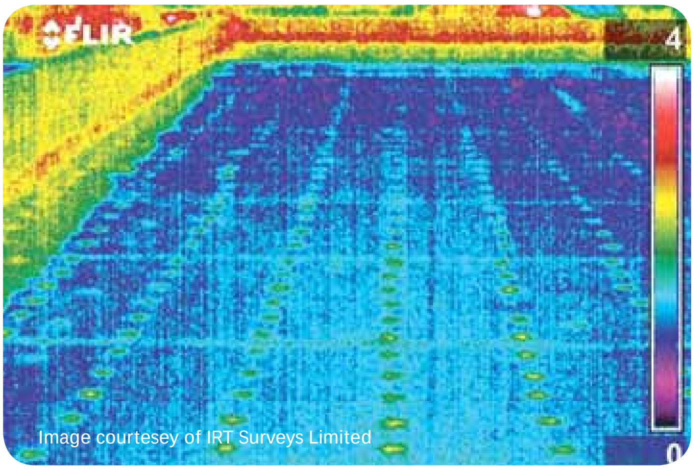
Condition and Nature of the Existing Waterproofing

It is important to determine the condition of the roof so that the correct remedial action can be taken. There are three main methods of diagnostics available:

Core samples - Investigative core samples assess your current roof construction and the condition of the substrate. This diagnostic method can be completed by your area technical manager and is included as part of our no obligation survey.

Moisture mapping - Non-destructive method of testing for trapped water within a flat roof build up. A moisture gauge is used to pinpoint the presence of dampness within the roof structure to depths of 200mm with the results delivered as a topographical map

Thermographic imaging - Non-destructive testing method that identifies defective roof areas currently allowing water ingress, which could remain undetected using standard inspection techniques. Thermographic surveys are conducted using infra-red technology to identify thermal irregularities, with recordings converted into a clear image of the roof's condition.



▲ Thermographic image showing thermal loss through mechanical insulation fasteners and around the base of a parapet wall.

Overlay or Strip the Existing Waterproofing?

If the intention is to overlay the existing roof system, the following basic criteria should apply:

1. **The existing roof system should be generally sound, dry, free from water damage and suitable to take an overlay system.**
2. **Overlay materials must be compatible with existing materials. In the case of Bauder bituminous systems this generally means asphalt and in some cases other bituminous membranes. Bauder liquid systems can be used to overlay almost all types of roof membrane. Synthetic single ply can also be used for refurbishment applications in some circumstances.**

Other points to consider when proposing to overlay:

1. **Waterproofing upstands and details should generally always be stripped and replaced.**
2. **There will be additional weight imposed on the structure by the installation of a new system.**
3. **An increased surface level will be imposed by the new system (especially when upgrading insulation) and its effect on adjacent detailing must be considered. Upstand heights should not be compromised and it may be necessary to raise DPC's, cavity trays, edge kerbs and fascia boards etc.**
4. **Products being overlaid may well have a shorter cause premature failure of the overlay system. For this reason, Bauder generally recommend that existing systems incorporating insulation are stripped rather than overlaid.**
5. **Building Regulations now require insulation to be upgraded in most overlay situations.**

The existing roof coverings should always be removed if there is any doubt over their long term integrity or if moisture is present; this may even include any underlying screed. Consideration must be given as to whether stripping the roof will also mean removing the drainage falls, if so, it will be necessary to incorporate new screed, or more conveniently tapered insulation to re-introduce new falls and maintain adequate drainage of the roof.

10 REFURBISHMENT ROOFS

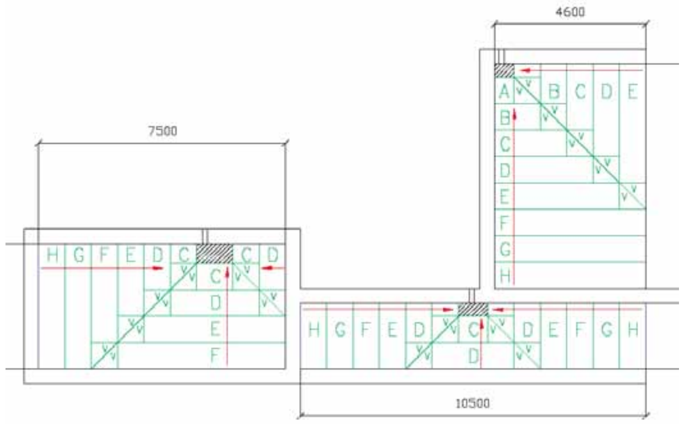
Improving Drainage Falls

A common fault with flat roofs is their inability to shed rainwater efficiently. This can be due to deficient original design, poor workmanship, deflection of the deck or a combination of all three.

During refurbishment, the opportunity should be taken to address any ponding that exists, as this will have negative effects on the roof.

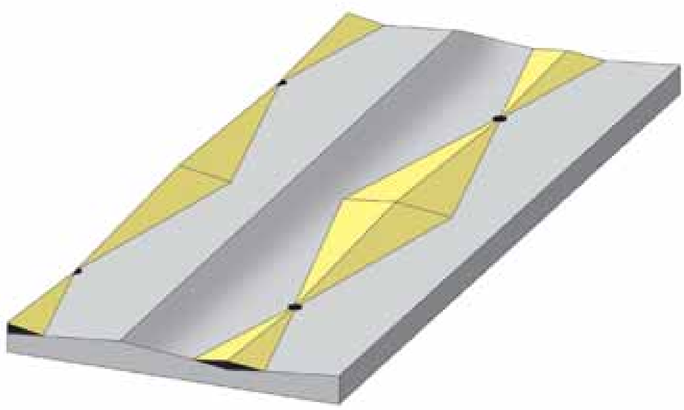
If the problem is due to a lack of rainwater outlets, consideration should be given to the possibility of adding some, although this may often be impractical due to connecting to the existing drainage system.

Tapered insulation can be used as a convenient and cost effective way of improving surface drainage, although it is not viable on every project and we advise that you utilise the experience of your Bauder area technical manager for further advice. Tapered insulation will ultimately create a thicker build-up to the roof system at certain points and may encroach on recommended upstand heights or create a necessity to raise perimeter detailing, cavity trays, clerestory windows etc. and therefore may prove to be financially prohibitive.



▲ Typical Bauder tapered insulation scheme

Bauder tapered insulation schemes can be designed to suit any particular project following a site survey by your Bauder area technical manager and should this product be considered beneficial, this will be offered as an option.



▲ Bauder tapered system to alleviate ponding water between outlets.

Building Regulations

Building Regulations state that when refurbishing or replacing an existing flat roof covering, the replacement system must also make provision for an upgrade to the thermal properties of the roof. Bauder can advise on the latest Building Regulation requirements, and make provision for the correct amount of insulation for your project within the bespoke specification that we provide. However, we would recommend that you seek confirmation of our advice from Local Authority Building Control before submitting the specification for tender.

Cold Roof Construction

If the refurbishment project in question is a cold roof design, upgrading the insulation in the ceiling void is often difficult as it will be necessary to remove either the ceiling or the roof deck in order to achieve this. Once exposed, it may be discovered that the existing void is too small to take the volume of insulation required whilst continuing to maintain an adequate cross flow of ventilation above it. Even if it is possible to upgrade the insulation in the ceiling void, it will be impossible to provide a continuous uniform thickness, due to the presence of structural supports. Therefore a certain amount of thermal bridging will occur.

It is often preferable to convert an existing cold roof to a warm roof construction, as this greatly reduces the problem of thermal bridging. However, this will mean that any existing ventilation provision below the deck will need to be sealed off and there may be a requirement to remove any existing insulation from the void, as this could cause condensation problems.

The Bauder Technical Department is always available to provide specialist advice or undertake thermal analysis calculations should this be required.

Warm Roof Construction

In the case of refurbishment of a warm roof, it is likely that the level of existing insulation will not be enough to satisfy current Building Regulations. There are commonly two options, either to overlay the roof and introduce additional insulation, or to strip the existing system and start again. The first option should only be considered if the existing roof is deemed suitable and compatible for an overlay.

Detail Design

Particular attention should be paid to the design of the new roof system to ensure that thermal bridging at perimeters and details is reduced as much as possible. Guidance on detail design is given by 'Accredited Construction Details' which is available from **www.planningportal.gov.uk**

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