

Code of Practice

Specification and Use of Liquid Applied Waterproofing Systems for Roofs, Balconies and Walkways

Produced by the Liquid Roofing and Waterproofing Association
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1 FOREWORD

During recent years liquid applied waterproofing systems have made huge strides in providing solutions to the practical problems within the flat roofing and waterproofing industry. Circumstances within the market, health and safety concerns and technical advances have made it possible for liquid applied waterproofing systems not only to become part and parcel of what is perceived as the traditional answer to flat roofing problems, but to become the leading solution to solving these problems.

The fact that liquid applications are totally seamless, and in many cases can be cold applied, has not been overlooked by the roof waterproofing industry. Many liquid applied waterproofing membrane manufacturers now provide complete solutions for the new build and refurbishment sectors including full insulated warm roofs that are generally completely cold applied. The seamless nature of liquid applied systems is now seen as the perfect waterproofing solution to anyone who wishes to utilise a roof area as a green roof terrace or a pedestrian trafficked podium roof, many of which are found within shopping centre type projects. The days of just using liquid systems purely as refurbishment coatings are well and truly over. We in the Liquid Roofing and Waterproofing Association understand the difficulties in choosing the right quality

products and their correct application/specification for the correct project, and to that end we have produced this Code of Practice to assist you to make your decision. This Code of Practice will not only help you with your choice of system and product, but also guide you with regard to health and safety, substrate preparation, specification preparation, product application and importantly quality control procedures on site. Within this Code of Practice there are suggestions with regard to how to carry out details with liquid applied membranes but it is important to remember that every project is different and all details should be completed in accordance with the specified manufacturer's instructions.

Please note that this Code of Practice is a guide that is aimed to help you with providing nothing but the best quality waterproofing system for your project but because of the differing types of liquid membranes available the manufacturer's specification must be strictly adhered to.



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2 GENERAL

2.1 SCOPE

The Code covers the selection and application of LRWA members' Liquid Applied Waterproofing Systems, Health and Safety aspects, procedures for specification of materials and methods, survey and inspection, observation of relevant regulations/legislation, utilisation of competent contractors including Quality Control and training, and maintenance.

2.2 INTRODUCTION

This Code of Practice has been prepared to provide specifiers, clients, suppliers, contractors, and other interested parties with a comprehensive guide for the waterproofing of roofs, balconies and walkways and treatment of associated fittings and constructions, using Liquid Applied Waterproofing Systems from LRWA members.

This Code of Practice is issued by the European Liquid Waterproofing Association. It is based upon best practice and provides guidance on the specification and use of Liquid Applied Waterproofing Systems.

Based on the collective experience of LRWA members, and that of manufacturers, suppliers, contractors and specifiers within the roofing and waterproofing industry, this Code is published with the intention of improving and maintaining performance and quality standards of Liquid Applied Waterproofing Systems materials and their application.

Whilst details may vary depending upon specific circumstances, the principles and methods used should be substantially the same as those set out in this document. In properly maintained structures, the methods set out here are designed to achieve satisfactory performance.

The information provided in this Code should always be used in conjunction with that given by the manufacturer of the liquid systems in use. The manufacturer's detailed literature and instructions for applying the specific Liquid Applied Waterproofing Systems should be carefully followed in all cases. The Code is not designed to constitute or provide a work specification.

LRWA acknowledges the participation of the representatives of the National Federation of Roofing Contractors in the preparation of this Code of Practice.

2.3 DEFINITIONS

For the purposes of this Code of Practice, the following definitions apply:

i) FLAT, PITCHED OR CURVED ROOFS

Flat Roof: The term flat roof is defined by the roofing industry in general, as a roof with an angle of slope or pitch of not more than 10° to the horizontal, constructed to form a barrier against climatic conditions.

However many designers of Liquid Applied Waterproofing Systems regard a flat roof as the plane or substrate which carries the waterproofing membrane. It may be flat horizontal, flat sloping or a plane of curvature. The weathering surface is continuous or made from large components in contrast to a tiled or slated roof.

Flat roof construction may be of in-situ or precast concrete, metal decking, timber or steel rafters, all of which may support other materials. Concrete decks may include an overlayer of concrete screed. On steel or timber joist constructions there will be a structural decking between the joists.

The materials under the roof weatherproofing system may then be any one of the following:

- Concrete or concrete screeds (normal or light)
- plywood
- oriented strand board (OSB)
- softwood timber boarding
- chipboard† (dense compound of wood chips and resin)
- foamed plastics insulation boards (polystyrene and polyurethane)
- fibreboard (various soft fibrous materials for insulation, in board form)
- wood wool† (wood fibres held by cement in an open celled board)
- strawboard† (compressed straw resin bonded)

†These decks are no longer used for new construction, but may be found in refurbishment work. Their structural integrity must be ascertained by a competent person.

Existing flat roofs in the UK for refurbishment works are likely to be covered by one or more of the following materials:

- mastic asphalt
- built-up bituminous felt
- flat metal sheets e.g. lead, zinc, aluminium, copper, stainless steel
- polymer sheeting (laid as one layer)
- promenade tiles - fibre cement
- liquid applied waterproofing systems

Flat roofs often provide an ideal location for plant or equipment and suitable maintenance access is then required.

Pitched Roof: It follows then that the industry definition of a pitched roof is one with an angle of slope or pitch exceeding 10° to the horizontal, constructed to form a barrier against climatic conditions.

Pitched roofs can be constructed with timber purlins and rafters or timber trusses, with battens for supporting tiles or slates. Where larger spans are required e.g. industrial properties, roof trusses of steel or pre-cast concrete would be used. These constructions would subsequently be covered with larger panels or sheet form materials such as profiled fibre/cement or metal sheets.

Existing pitched roofs in the UK are likely to be covered with the following materials:

- concrete tiles (single or double lap)
- clay tiles (single or double lap, glazed or unglazed)
- slates – natural, fibre cement and simulated resin based (single or double lap)
- profiled sheet in galvanised or coated steel, uncoated or coated aluminium, fibre cement or bitumen
- shingles – wood or reinforced bitumen

Fully supported finishes, less used on pitched roofs than flat, may be used on some pitched areas, such as north lights, dormers or mansards. These are laid over flat board materials and the finish may be:

- mastic asphalt
- built-up roofing felt
- polymer sheeting
- flat metal sheeting, lead, zinc, copper, aluminium
- Liquid applied waterproofing systems

Curved Roofs: The surface materials used on curved roofs may be any of those used on pitched or flat roofs.

ii) ROOF TYPES

Warm Roof: In the construction of warm roofs the principal thermal insulation material lies immediately beneath the weatherproof covering and on top of the roof deck and any vapour control layer necessary i.e. above the structural deck. The deck and cavity are thus maintained at warm temperatures during the winter. Liquid Applied Waterproofing Systems are used as the

external waterproofing finish.

Inverted Roof: In this type of construction the principal thermal insulation material is applied on top of the weatherproof covering so that the complete roof construction including roof covering is kept at warm temperatures during the winter months and at moderate temperatures during the summer months; the system is also referred to as a 'protected membrane', or 'upside down' roof. Liquid Applied Waterproofing Systems are used as the waterproofing layer below the insulation layer, usually directly over the structural deck.

Cold Roof: In this type of construction the principal thermal insulation material is placed below the roof deck, normally at ceiling level. Heat loss through the ceiling is thus restricted keeping the cavity, roof deck and covering at low temperature during winter conditions. The concept is usually concerned with roof structures which include an independent ceiling enclosing an air space between the deck and ceiling. Liquid Applied Waterproofing Systems are used as the external waterproof finish over the structural deck.

Note: Cold roof voids must be ventilated to avoid the build up of interstitial condensation. With increasing insulation requirements the use of cold roof constructions for new flat roof constructions is, therefore, declining.

iii) Other Roof Types

Not all roof constructions will fall within the warm or cold categories and the concept can be misleading if the exceptions are not recognised. Some structural decks are themselves composed of insulating materials, for example wood wool, and it is difficult to place the final roof construction into a warm roof or cold roof category.

Cases also arise where insulation is added above the deck in addition to insulation at ceiling level, and again it is difficult to categorise the construction. These exceptions are sometimes called hybrid roofs. Generally this is not good practice and any roof void ventilation must be properly considered to reduce the effects of condensation. Calculations can be made to estimate the extent of condensation risk and Liquid Applied Waterproofing Systems may be used by consultation with individual manufacturers.

iv) BALCONIES, TERRACE ROOFS AND WALKWAYS

Balconies

A balcony is a platform on the outside of a building, with access from an upper-floor window or door and is usually enclosed by a balustrade, railing or parapet. Balconies can project out from the building or can form the roof (or part of a roof) to a room below.

Balconies are frequently of concrete construction and existing balconies may be left exposed or waterproofed with asphalt or have an aesthetic coating. Where a balcony forms part of a roof to a room below, the thermal performance must be considered.

Balconies often have a wearing surface as part of the liquid applied system or can be finished with bonded tiles or loose laid tiles or decking.

This code of practice only covers waterproofing applications. Aesthetic coating systems may follow most of this guidance, but they should be installed in accordance with the manufacturer's instructions.

Terrace Roof

A terrace roof is a flat roof used as an amenity area. These roofs tend to be waterproofed and have separate finishes such as tiles, paving slabs or timber decking boards. They are generally open to public access.

Walkways

Walkways are areas of communal access to flats. Like balconies, walkways can have a wearing surface as part of the liquid applied system or can be finished with bonded tiles.

v) GREEN ROOFS

By their seamless nature, Liquid Applied Waterproofing Systems are ideally suited for use in green roofs. Root resistant grades are also available which negate the need for a separate root resistant layer. The scope of this document does not allow for a full explanation of green roof terminology and the guidance of the manufacturer is to be sought.

vi) SOLAR REFLECTIVITY

Light coloured finishes will reflect a greater proportion of the sun's radiated energy compared with black or dark finishes. Light finishes will therefore result in a lower level of heat build up within the roof deck and the building. A reduction in heat build up is desirable since it reduces the rate of degradation which can occur within the coating, and also presents the possibility of a more equable

environment within the structure of the building. Light coloured finishes - typically white, light grey or aluminium - either obtained by overcoating or by self colour, yield the best reflectance. Liquid Applied Waterproofing Systems may be applied onto existing solar reflective finishes after suitable preparation and/or priming. The Liquid Applied Waterproofing Systems supplier should be consulted.

vii) INSULATION

Insulation is used to retain heat and prevent thermal gain in a structure. There are many different types (and manufacturers) of insulation that can be used on roofs. The insulation can either be applied on top of the Liquid Applied Waterproofing Systems system (inverted or upside-down roof) providing the insulation will not absorb moisture; or the Liquid Applied Waterproofing Systems system can be applied onto the insulation (warm roof). Insulation manufacturers must be consulted on whether their product can be incorporated in a warm or inverted roof design. Many Liquid Applied Waterproofing Systems manufacturers also supply insulation and ancillary products that are approved for use with their systems.

At all times individual manufacturer's recommendations must be sought when selecting and applying a Liquid Applied Waterproofing Systems in conjunction with any insulation.

viii) GUTTERS

In flat roof designs, gutters are usually constructed as part of the flat roof deck construction. In warm roof constructions, gutters may be designed as part of the insulation system, especially with tapered insulation schemes. Gutter linings use materials that are generally the same as for the main roof areas as listed above, but for pitched roofs the gutters may be external self-supporting products of:

- galvanised or plain steel
- extruded PVC
- extruded or rolled aluminium
- cast iron
- GRP
- Fibre cement sheet

Some internal gutters may not have a separate lining material as the main roof but be semi-structural self finished material such as galvanised or plain steel, cast iron or asbestos cement. These are usually included in Liquid Applied Waterproofing Systems treatments.

ix) FLASHINGS AND TRIMS

Flashings are generally required on upstand details unless the detail is otherwise suitably protected. For refurbishment work, flashings can be made of flexible sheet materials such as lead, aluminium, copper, zinc, asphalt, bituminous felt, PVC, self-adhesive flashing tapes or lead. Some Liquid Applied Waterproofing Systems can be self flashing with suitable termination details and the manufacturer's recommendations should be sought.

Trims are generally of preformed or extruded aluminium or GRP.

x) ROOFLIGHTS

General: For all flat roof systems, out of plane rooflights will be the norm. These comprise an upstand kerb and a glazing element. The upstand kerb will be waterproofed to a suitably protected termination. Rooflights to pitched roofs may be in plane or out of plane depending on the roof type. In plane rooflights are usually made of plastic material such as PVC, GRP or polycarbonate and are shaped to match the profile of the metal or fibre cement sheets.

Important Notes:

- It is important for the safety of operatives to locate all rooflights as they may have been coated or otherwise concealed from view. Rooflights should never be walked upon.
- Access to rooflights is ideally prevented or protected and not just marked by signage. This is particularly important when a pigmented coating has been used as the rooflight may blend with the roof.
- The complete coating of rooflights with pigmented liquid roof coatings should be avoided, but if unavoidable, they must be clearly and permanently marked for future identification following current regulations, e.g. by safety tape, but see note above.
- Clear coatings designed specifically for use on rooflights may be used, but, the fragility of existing rooflights and their overall suitability to be coated must be carefully assessed.
- New or replacement rooflights must have a suitable non-fragility classification for the intended use.

Inspection:

Rooflights of all types may be broken or cracked and these should normally be replaced. Sheet glass may have slipped down the roof within their frames, and these should be repositioned or, if this is not possible, replaced. Where side joints of patent glazing are leaking they should be

waterproofed as part of the Liquid Applied Waterproofing Systems treatment. The chosen manufacturer's guidance must be sought.

The repair of profiled plastic rooflights and their fasteners should be carried out with that of the main roof areas. Particular care should be taken around fasteners to ensure that they are correctly sealed. Reinforcing material should always be used at side and end laps of these rooflights, bedded in liquid roof coating prior to covering the whole roof area.

xi) SLIP RESISTANCE

There will be occasions when it is necessary to provide a safe walkway or leisure area upon roofs which are treated with a Liquid Applied Waterproofing Systems. This is particularly necessary for situations where foot traffic in wet conditions may be required, and it may be achieved by the incorporation of suitable aggregate with a bonding coat or within the final layer of liquid in a multi-layer system.

Alternatively, the use of appropriate promenade tiles will provide a safe surface upon which to walk.

In all cases the manufacturer of the Liquid Applied Waterproofing Systems should be consulted about the suitability of any proposed system.

xii) PONDING

Flat roofs are usually constructed with slight falls, typically 1:80, which will allow water to drain away. Minor constructional variations in the plane of the surface will allow the collection of water which has no way of draining. It is therefore advisable to design roof falls greater than the required finished falls to allow for construction tolerances and dead and imposed loads. Where systems are designed for use on totally flat constructions then back falls must be avoided.

In minor cases this water will disappear within a few hours. However, poorly constructed roofs or older roofs which have in some way sagged will hold water for many days or weeks. In these circumstances the conditions is known as ponding and it will be typified by the presence of associated algae, the accumulation of atmospheric debris and other plant growth. The additional load of ponded water on the roof structure should be considered.

xiii) PRE-INSPECTION

Prior to the specification of a Liquid Applied Waterproofing Systems for remedial applications, it is necessary to inspect existing roof structures and assess the old waterproofing system for its suitability.

Pre-inspection guides the specifier toward the most suitable system, noting the needs for preparation, minor building work and related matters such as the need for any thermal upgrade, flashings and rooflights.

For new work, pre-inspection will identify any potential problems with the substrate, such as back falls.

xiv) POST INSPECTION

All work requires an inspection following the completion of work using a Liquid Applied Waterproofing Systems. Post application inspection can cover such items as:

- application rate - film thickness
- reinforcement
- minor building works
- reinstatement of flashings
- adherence to the design specification
- film condition (especially for products which cure)
- detailing and other related matters

xv) ELEMENTS OF Liquid Applied Waterproofing Systems

Substrate

Any surface which forms the basis of the roof structure e.g. concrete, wood, metal, insulation, together with existing waterproofing systems if this is appropriate.

Primer (or stabiliser)

Usually a low viscosity product which is applied to improve the adhesion of a Liquid Applied Waterproofing Systems to the substrate. A primer is not used to replace adequate surface preparation such as brushing or cleaning, but will on occasions help to consolidate a friable or porous layer. The Liquid Applied Waterproofing Systems manufacturer must be consulted to ascertain the correct priming regime.

Waterproofing Membrane Liquid Applied Waterproofing Systems

A liquid applied product which once applied to the roof substrate and cured will provide protection against water ingress. Various types of coating may be used including for example solutions, emulsions, chemically curing single or two pack systems. (See 3 Generic Types of Liquid Applied Waterproofing Systems below)

Solar Reflective Coating

One of the elements of the system may be the last coat which can be either light coloured or pigmented with polished aluminium flake. The purpose of this coat is the reduction of heat absorption by the reflection of solar radiation.

Reinforcement

On occasions it is necessary to strengthen a Liquid Applied Waterproofing Systems by the inclusion of a suitable reinforcement wetted between successive coats. There are a number of possibilities including glass cloth, chopped glass matt and needled polyester fleece. Reinforcement may especially be necessary at points of stress concentration such as upstands, movement cracks and expansion joints. Consult the Liquid Applied Waterproofing Systems manufacturer's instructions for their recommendations.

3 GENERIC TYPES OF LIQUID APPLIED WATERPROOFING SYSTEMS

Liquid Applied Waterproofing Systems can be Categorised into a number of different families of Products to offer a highly durable solution to the refurbishment of existing roof, balcony and walkway systems.

It is necessary to consider how systems of these different products will perform relative to the client's requirements.

3.1 EUROPEAN TECHNICAL APPROVALS (ETAs)

As a requirement of the Construction Products Directive (80/106/EEC), European Technical Approvals (ETA's) have been produced for Liquid Applied Waterproofing Systems. The work has been undertaken in each member state by national technical committees and approval bodies and the overall co-ordination of the documents has been the responsibility of the European Organisation for Technical Approval (EOTA). The objective has been to produce harmonised technical standards for Liquid Applied Waterproofing Systems.

A variety of types of Liquid Applied Waterproofing Systems exist and it was recognised that the ETAs should accommodate these systems in a formalised structure. This has led to the development of, to date, eight separate parts to the ETA, each covering a generic type.

3.2 ETAG and ETA Parts

The primary document ETAG 005 (Part 1 General) gives overall guidance on assessment of fitness for use, including methods of verification and attestation of conformity. The remaining seven parts, known as the Complementary Parts or the ETA Parts, deal with specific requirements for particular families of products and are the generic types (covered in more detail by Guidance Note 3 - Generic Types of Liquid Applied Waterproofing Systems for Roofs, Balconies and Walkways and are:

Part 2:	Polymer modified bitumen emulsions and solutions
Part 3:	Glass reinforced resilient unsaturated polyester resins
Part 4:	Flexible unsaturated polyesters
Part 5:	Hot applied polymer modified bitumens
Part 6:	Polyurethanes
Part 7:	Bitumen emulsions and solutions
Part 8:	Water dispersible polymers

Other parts may be added in due course.

It is recommended that only systems holding current Agreement Certification or ETAs for Roofing, Balconies and Walkways should be specified

3.3 National certification

National approval for liquid applied systems in the UK can run in parallel with ETAs and involves Agreement certification from the British Board of Agreement (BBA) (a member of the UEAtc and EOTA). BBA Certificates for the approved systems are based on the same test procedures as detailed in ETAG 005 but also include additional statements on the UK national building regulations and non-regulatory requirements, standards, design and installation details and a durability statement. Current certificates are downloadable from the BBA website www.bbacerts.co.uk

4 HEALTH & SAFETY PROVISION FOR LIQUID APPLIED WATERPROOFING SYSTEMS ON ROOFS, BALCONIES AND WALKWAYS

The Health and Safety at Work Act deals with fundamental working practices. Other legislation contributes to the welfare of those undertaking the work and those in the vicinity of the work. Whilst the Construction (Design and Management) Regulations may not be a legal requirement on short-term contracts, it is good practice to apply the principles to all roof, balconies and walkways.

It is important to gather as much health and safety information about a project and the site before work begins. A survey of the site should be made by a competent qualified person

4.1 SAFETY DATA SHEETS

Standard 'CHIP' (Chemical Hazard Information and Packaging) Safety Data Sheets issued by product manufacturer are essential reading prior to handling any materials. They contain information under 16 headings which are shown as following:

Primary headings for safety data sheets ex manufacturers:

1. Product and company identification
2. Composition/Information on Ingredients
3. Hazard identification
4. First aid measures
5. Fire fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure control/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

4.2 REFERENCE CHECKLIST

The following non-exclusive list shall be considered in relation to safety:

- Construction (Design and Management) Regulations (CDM) - relationship at time of quote
- Contact with the client's CDM Co-ordinator or safety officer
- Contact with the client's planning supervisor
- Safety during initial site visit by estimator
- Scaffold erection and removal
- Delivery, unloading, lifting and storage of materials
- Provision of edge protection
- Access for inspection purposes. Specific assessment of:
 - materials containing asbestos
 - fragility classification of the roof (ACR Red and Green books)
 - rooflights
 - vents with fumes (prevention of taking in fumes & discharges)
 - birds (especially sea)
 - unstable parapets
 - safety lines (recently tested and certified)
 - Harnesses/Fall restraint
 - condition of gutters
 - Note: If the roof or any part of it cannot be assessed beyond all doubt as non-fragile, then it must be treated as fragile and the roof must be accessed in accordance with the guidance given in the ACR Green Book.
- Decisions relating to specification, e.g. will it be possible to transport equipment, raw materials etc
- Health and Safety cost implication - adequate funding should be provided
- Risk assessments should be provided and work methods agreed with the CDM Co-ordinator/Safety Officer prior to commencement on site
- Special client requirements for work area, i.e. site Health and Safety requirements, personal protection equipment (PPE), working hours, etc
- Specification, COSHH, working environment, training, site supervision, method of work, waste regulations, disposal of containers
- Safety during final quality check
- Removal of site waste

4.3 HEALTH AND SAFETY IN ROOF WORK

Falls from height are the most common cause of accidental death in the construction industry and account for half of those accidentally killed. Compliance with current Working at Height (WAH) Regulations and HSE guidance on scaffolding etc will help reduce falls and also injuries to others caused by materials falling from a roof.

'Health and safety in roof work' HSG 33 from HSE Books, 2008, is essential reading for all concerned with the commissioning, design or execution of roof work or with responsibility for those who work on any new, repair or refurbishment site.

Also "Working on Roofs" INDG 284 from HSE and Guidance Note 7 from the Work at Height Safety Association (WHSA) is recommended

The Advisory Committee for Roofwork (ACR) has produced several useful roof safety publications that are available to download on www.roofworkadvice.info

Further information/ references can be found on the LRWA Guidance Notes 5 and 6 on "Provision" and "Safe Use" of Liquid Applied Waterproofing Systems on Roofs, balconies and walkways.

4.4 CDM REGULATIONS

The Construction (Design and Management) Regulations 2007 has the main purpose of establishing a safety management network at all stages of a construction project. Obligations are imposed on everyone but principally a CDM Co-ordinator and principal contractor. There must be a safety plan to combat risks at source and this will involve a method statement from suppliers based on their own health and safety plans. LRWA manufacturers of Liquid Applied Waterproofing Systems are compliant with these aims.

4.5 COSHH REGULATIONS

The Control of Substances Hazardous to Health Regulations 2002 (as amended), are designed to protect workers against the risk of exposure to substances considered to be hazardous to health. The use of such substances arises out of or in connection with work undertaken under the control of the employer. The hazards that may be associated with the chemicals used in Liquid Applied Waterproofing Systems will be shown in the CHIP Safety Data Sheets issued by the Liquid Applied Waterproofing Systems supplier. Under the regulations, the contractors must prepare and submit a suitable COSHH assessment to the client/contract administrator for all materials falling under the regulations.

5 BUILDING REGULATIONS

5.1 ESSENTIAL REQUIREMENTS:

The chosen specification must be capable of satisfying the Building Regulations/Standards and their subsequent amendments for each country in the UK. There are 3 relevant physical properties that the systems must satisfy for the Building Regulations, namely resistance to fire, fitness of materials and workmanship, and resistance to moisture. The requirements for thermal performance for new work or any thermal upgrade for remedial applications must also be considered.

RESISTANCE TO FIRE:

The system should have been tested by an appropriate testing body to assess its reaction to the external spread and penetration of fire. The system should achieve a designated level of resistance for acceptance. UK Building Regulations make reference to BS 476-3:2004 as the standard test method or determined in accordance with BS EN 13501-5:2005.

FITNESS OF MATERIALS AND WORKMANSHIP:

Regulation 7 stipulates that building work shall be carried out with adequate and proper materials which:

- are appropriate for the circumstances in which they are used,
- are adequately mixed or prepared, and
- are applied, used or fixed so as adequately to perform the functions for which they are designed; and
- in a workmanlike manner.

RESISTANCE TO MOISTURE:

The systems, being promoted as waterproofing products, must satisfy the requirement of resisting precipitation.

6 SUBSTRATES

6.1 Introduction

The primary objective of Liquid Applied Waterproofing Systems treatment is to waterproof, for the minimum period of time required by the client, the substrate to which it is applied. The successful application and performance of Liquid Applied Waterproofing Systems is largely dependent upon the suitability and preparation of the substrate. The Liquid Applied Waterproofing Systems can be applied direct to the substrate or may be part of a built up system including insulation and ancillary materials such as vapour control layers and carrier membranes. For built up systems, the insulation or carrier membrane will be the substrate for the application of the Liquid Applied Waterproofing Systems, however, the structural substrate may also require preparation prior to the installation of the insulation system. Some Liquid Applied Waterproofing Systems manufacturers supply products for the whole system. This is the preferred option as the manufacturer will have responsibility for the compatibility of the system, but this does not exclude the use of materials from different sources. In either case, the recommendations of the Liquid Applied Waterproofing Systems manufacturer are to be followed.

The correct installation of a system requires that the manufacturer's recommendations are followed. Whilst varying from system to system, these recommendations will refer to all stages of installation including substrate suitability and preparation.

Not all systems will be suitable for use on all substrates. Specifiers and users of a Liquid Applied Waterproofing Systems must ensure that the substrate is suitable for the chosen system.

6.2 Categorisation of Substrates

Whilst a wide variety of substrates exist, from the point of view of Liquid Applied Waterproofing Systems application, they may be broadly categorised as follows:

6.2.1 Substrates suitable for direct treatment:

These are substrates which, when correctly prepared, provide a suitable base for a direct Liquid Applied Waterproofing Systems application. Substrate preparation can include a requirement for pre-treatments, treatment and removal of biological growths, priming systems and joint treatments. Section 7 gives a review of

preparation methods. Substrates for new build work may also be included in this category, especially if they are of known manufactured quality, such as plywood.

6.2.2 Substrates requiring more detailed examination:

These are substrates which require a detailed investigation before a chosen Liquid Applied Waterproofing Systems treatment can be confirmed. Although this is usually required for refurbishment applications, it may also be needed for new build substrates that may be more variable, such as new cast in situ concrete decks. The investigation may include:

- visual inspection of poorly described existing substrates
- core sample to determine or confirm the structure and any insulation requirements
- carrying out adhesion tests
- moisture content determination
- substrate surface finish assessment

6.2.3 Substrates unsuitable for Liquid Applied Waterproofing Systems treatment:

There are a number of substrates which are not suitable for direct treatment with Liquid Applied Waterproofing Systems. These substrates will need either to be removed or will require the overall application of a carrier membrane to provide a suitable base for the Liquid Applied Waterproofing Systems. Examples of unsuitable substrates include:

- coal tar/pitch surfaces
- insulation materials with an open structure
- insulation materials which may react with the Liquid Applied Waterproofing Systems
- moisture sensitive timber sheets

6.3 Further Guidance

A wide range of Liquid Applied Waterproofing Systems types exist and it is possible to find a suitable coating to apply in the large majority of situations. In LRWA Guidance Note No. 3 the most commonly encountered substrates are listed together with explanatory notes. Whilst this list may not be exhaustive, it represents the current knowledge of LRWA member companies.

7 SPECIFICATION, PREPARATION & APPLICATION

7.1 General

In order to draw up a specification, the following criteria should be taken into account:

The performance of a Liquid Applied Waterproofing Systems is dependent on the substrate construction and its condition. Treatment should only be carried out on structures that are sound.

7.2 Preliminary Inspection

For refurbishment, the choice and recommendation of a Liquid Applied Waterproofing Systems should only be made on completion of a full inspection of the construction in accordance with Health & Safety criteria (see Section 4). A survey should involve both internal and external inspection of the construction in order to ensure the correct diagnosis is made. Timber decks and other degradable or non-durable decks should always be fully examined. Core samples should always be taken to assess the condition of the existing construction. This can identify areas of concern such as damp insulation whether from leaks or interstitial condensation. If the deck cannot be inspected from below, core samples should be taken through to the deck to assess its condition.

A survey inspection must take into account the condition of the supports, the roof deck, the insulation and the existing waterproofing and must take into consideration moisture in substrates, condensation and the possible requirement for breather vents or vapour checks.

For new build, the system will usually be specified before the roof structure is built. It is still good practice to inspect the deck prior to the installation of the system.

7.3 Roof Construction

Inspection

The supporting structure should be visually inspected and, where possible, for refurbishment applications the original specification of the construction sought to assist in assessing the work required. It is important to identify the correct roof construction.

Examination will include but not be limited to the following examples - 7.3.1 to 7.3.12 - these are defined in Section 2.3.

NOTE 1) LRWA Guidance Note No 3 lists acceptable substrates for Liquid Applied Waterproofing Systems treatments.

NOTE 2) Incorrect identification may lead to an incorrect specification or application method. It may also lead to a dangerous situation for operatives working on the roof.

NOTE 3) Some of the common misconceptions connected with identification are as follows:

- That all profiled or corrugated sheeting is fibre cement. It may be coated steel, aluminium or other composite material.
- That all materials that are black are asphalt. They can also be bituminous felt or polymeric single ply.
- That all built-up felting is made up of three layers when frequently the number of layers is less or more. Bituminous felt is also confused with black coloured polymer layers, often laid as a single sheet.
- That all flat metal sheet is lead. Frequently it is zinc, aluminium, zinc coated steel, copper or stainless steel.
- That all fibrous decking materials are wood wool, frequently they are compressed strawboards.

The following non-exhaustive list shall be considered in each case:

- Flat, pitched or curved roof
- Warm, cold or inverted roof
- Roof void ventilation if required
- Solar reflective or painted surface
- Slip resistance required
- Insulation type
- Rainwater outlets, gutters or rainwater pipes
- Flashings and trims
- Penetrations
- Rooflights
- Tanking
- Ponding

7.4 Specification

7.4.1 Preparation

The following list comprises basic guidelines only, it may not be as comprehensive as the information from an individual Liquid Applied Waterproofing Systems supplier whose instructions will take priority. It is essential to the long-term performance of the chosen Liquid Applied Waterproofing Systems that thorough preparation of the substrate is undertaken as the Liquid Applied Waterproofing Systems can only be as good as the substrate condition allows.

i) Cleaning

Remove all dust or loose material, inspect, repair, prepare, make clean and dry, note the following:

- Remove chippings where possible using a stiff bristle broom, if embedded e.g. in asphalt they may be removed with a suitable scabbling machine or power grinder. Care must be taken where chippings/ bitumen layer is over insulation as the insulation may be damaged, it may be more

economical to remove the entire waterproofing and/or insulation layer and apply a carrier membrane prior to a Liquid Applied Waterproofing Systems.

- Use a stiff bristle broom to remove all moss, lichen, leaves, silt and other debris particularly in corners, at eaves, joints, gutters and areas susceptible to ponding. Existing substrates are generally power washed but must be at least washed with clean water prior to inspection/repair.
- High pressure water cleaning is very effective on most substrates. However this method of cleaning may pump water into the building through defective joints and prior inspection is essential to avoid damage to insulation or plaster that can be soaked at ceiling level. Free flow of drainage must also be ensured (see below). Pressure water cleaning is not recommended for asbestos cement (see next item).
- Cleaning of fibre cement roofs is required to meet the Health and Safety Regulations and most particularly where there is the presence or even suspected presence of asbestos. Advice is given in HSG 33 from HSE, and specifiers and contractors are also referred to the following; The Control of Asbestos Regulations: EH10, EH35, EH36, EH41, MDHS 39/2 and EH71. When cleaning ensure that no debris/swarf can escape into rainwater downpipes. Should this happen then they must be washed out, with debris/swarf caught in suitable filters for disposal. Open High pressure water cleaning is not recommended. All washings must be collected, and marked with appropriate hazard label for suitable disposal. If the debris does contain asbestos it will need to be treated as "special waste" under the Control of Pollution (Special Wastes) Regulations.
- When cleaning ensure that no debris can cause blockage in the rain downpipes. Downpipes and gutters may be cleaned by rodding with access obtained around bends through detachable access plates.

ii) Repair

- Built-up felt blisters should be star cut and the four corners folded back. Dry out any moisture and re-bed the felt by use of the Liquid Applied Waterproofing Systems or a suitable adhesive where appropriate. Ensure that the adhesive closely seals the cut lines, indicated by a continuous line of adhesive exuding from the cut joint. Badly damaged felt should be replaced.
- Asphalt cracks should be resealed to ensure substrate continuity. Ruckles and slumps should be inspected

and if necessary smoothed out and made good, this is particularly important where reinforcement is to be added to Liquid Applied Waterproofing Systems to ensure good substrate contact.

- Single ply membranes must be correctly laid and securely mechanically fixed. Any repairs to defects must be repaired with compatible materials. Where extensive damage is evident, for example splits or embrittlement, the membrane should be removed and a carrier membrane used instead.
- Concrete and screeds should be inspected for soundness. Any live cracks should be noted for special consideration. Repairs may range from sand and cement to polymer modified speciality repair mortars and screeds.
- Other substrates are subject to general inspection and repairs appropriate to that material.
- Where the deck or insulation is suspected of being wet below the existing waterproofing layer, take core samples and determine moisture presence or otherwise. Note that water can track extensively under mechanically fixed or partially bonded systems. Not all material if damp will need replacing as long as it will still perform as required and can be suitably dried out. Replace rotten wood or fibre based materials and any other affected materials. Cut out damaged areas back to sound dry material and replace with new material of correct thickness. A proprietary venting system may be required to be installed where general dampness requires drying out in parallel to the Liquid Applied Waterproofing Systems being applied (The guidance of the Liquid Applied Waterproofing Systems manufacturer should be sought as some systems are vapour permeable - see also 7.4.3).
- Repair can also include the replacement of non-desirable decks such as chipboard or strawboard with a new non-moisture susceptible material.
- Ensure the repaired area is clean and thoroughly dry before applying the Liquid Applied Waterproofing Systems.

iii) General

- Rainwater outlets must be inspected to ensure they are not blocked, are sound and free draining. Additionally, water should not be impeded by the build up of previously applied systems. Gutters must be cleaned and inspected.
- Agree arrangements for making good to penetrations such as pipes, vents, flues, hand rails, etc. Add or renew collars and flashings.
- Fixed items which are not to be included in the

coating schedule, including wires, cables, etc., must either be totally removed or, in order to allow access, be suspended from the surfaces to be coated. Such items should only be removed with prior agreement.

- Only lift lightning conductors, cables, etc by prior arrangement and DO NOT COAT WITH Liquid Applied Waterproofing Systems.
- Lift metal flashings to enable installation of Liquid Applied Waterproofing Systems below.
- Skirtings must be inspected and if necessary made good. Provision for re-installation must be made if missing or inadequately formed.
- Ensure rooflights, vents, gutters and other fittings are capable of being treated or lapped onto.
- Increase heights if necessary where insulation is being added or falls being changed.
- On masonry upstands, the Liquid Applied Waterproofing Systems may be finished into a suitable chase cut and subsequently sealed. Alternatively termination bars or surface mounted cover flashings may be used in accordance with the Liquid Applied Waterproofing Systems manufacturer's instructions.
- Inspect for fire risk particularly if torches or solvent based materials are being used. Check to ensure that adequate appropriate fire fighting equipment is available. Hot work permits must be obtained.
- Agree access and safety requirements.

iv) Pre-Treatments Prior to Liquid Applied Waterproofing Systems

- Anti-fungal treatments may be applied after cleaning and should be allowed to dry (see manufacturer's methods of application and usage).
- Some substrates may require specific pre-treatments such as an etch primer for aluminium or galvanized steel.

- Generally consider the elements of the surfaces to be treated for those items which may require specific pre-treatments apart from general priming and Liquid Applied Waterproofing Systems application.

7.4.2 Installation/Application

(i) The choice of Liquid Applied Waterproofing Systems should be made with reference to Section 3 of this Code, i.e. Generic Types.

(ii) Methods of application of Liquid Applied Waterproofing Systems are - brush/roller/airless spray/squeegee with others as defined by manufacturer's method statements.

7.4.3 Accessories and Ancillary Items

Items, such as trims, vents, rooflights, sealants etc. must be compatible with the Liquid Applied Waterproofing Systems and most Liquid Applied Waterproofing Systems manufacturers either supply these items themselves or have recommended suppliers. The guidance of the Liquid Applied Waterproofing Systems manufacturer must be followed.

7.5 Storage

All materials must be stored carefully in accordance with the manufacturers' instructions, and proper site storage must be arranged by the contractor.

7.6 Categorisation of User Loads

The following extract is from the 'European Technical Approvals – General' PART 1 Standard and indicates the choice that should be made in the selection of Liquid Applied Waterproofing Systems.

The 'systems', including its support and protection (if any), shall be capable of withstanding mechanical damage due to the user loads likely to occur during its working life. The risk of mechanical damage will depend on the accessibility of the roof and the frequency of the traffic

Table 1 - Categorisation according to user loads

Category	User Load	Examples of accessibility
P1	Low	Non-accessible
P2	Moderate	Accessible for maintenance of the roofing only
P3	Normal	Accessible for maintenance of plant and equipment and to pedestrian traffic
P4	Special	Roof gardens, inverted roofs, green roofs

envisaged. Table 1 gives the appropriate categories of user loads and examples of the related accessibility.

7.7 Durability and Working Life

The durability of Liquid Applied Waterproofing Systems can range from 5 to 25 years. The stated durability of Liquid Applied Waterproofing Systems must be supported by independent assessment, such as a valid BBA Certificate. The following extract is also from the 'European Technical Approvals – General' PART 1 Standard and indicates how categories are assigned to the Liquid Applied Waterproofing Systems working life:

The estimated working life of 'systems' for the intended use is 10 years. In special circumstances, where indicated by the applicant, this may be modified to 5 or 25 years.

An estimated working life of 'systems' of 5 years shall only be assumed in the case of Liquid Applied Waterproofing Systems intended for use as a repair, renovation or maintenance medium only, or for use solely in construction works which have a limited intended life.

An estimated working life of 25 years shall only be assumed in the case where the applicant can offer, for examination by the approval body, examples of satisfactory use of that 'Liquid Applied Waterproofing Systems' for a period of at least 5 years in a relevant situation and/or climate. All product specifications and assessment methods shall take account of this expected working life of 25 years. Table 2 gives the categories according to working life.

The indication given on the working life of 'system(s)' cannot be interpreted as a guarantee by the applicant

Table 2 - Categorisation according to working life

	Category W1	Category W2	Category W3
Expected working life	5	10	25

(or the approval body) but is regarded only as a means of choosing the right products in relation to the expected economically reasonable working life of the works.

NOTE: The above is not exclusive, systems for e.g. 15, 20 years and possibly >30 years may be negotiated also. Fully protected Liquid Applied Waterproofing Systems may have working lives comparable to the structure itself.

7.8 Climate Effects

The following extract is also from the "European Technical Approvals - General" PART 1 Standard and indicates how categories are assigned to two European Climate zones.

The 'system', including its support and protection (if any) shall be resistant to the solar exposure effects (solar energy, temperature etc) occurring during its expected working life which will depend on the geographical location of use. Two categories of climatic zone have been established (Moderate and Severe) and a table defines the limiting values for mean annual radiant exposure and the mean air temperature during the warmest month. The

UK comes into the Moderate zone.

7.9 Surface Protection over Liquid Applied Waterproofing Systems (where required)

Most Liquid Applied Waterproofing Systems can be used as the final finish to the roof system. Some Liquid Applied Waterproofing Systems, however, will need protection from exposure to ultra-violet light, roof traffic or fire spread. In these cases suitable protection methods should be used, for example;

- Promenade tiles
- Aggregates
- GRP/GRC terrace tiles
- Concrete pavements
- Solar reflective
- Rubber granule extended coatings

7.10 Details and Terminations

The following typical details are included to demonstrate the general principles behind the detail and are not to be considered as construction details. The guidance of the Liquid Applied Waterproofing Systems manufacturer should be sought.

Fig 1: Built Up Roof Perimeter Kerb Detail GRP Trim

Fig 2: Built Up Roof Upstand Termination Detail to Pre-Cut Chase

Fig 3: Built Up Roof Termination Detail to Outlet with Sump/Gutter

Fig 4: Built Up Roof Insulated Upstand to Lead Flashing

Fig 5: Built Up Roof Termination Details to Perimeter Gutter

Fig 6: Built Up Roof Rooflight Detail

Fig 7: Built Up Roof Termination Bar Detail to Upstand

Fig 8: Built Up Roof Pipe Penetration Detail

Fig 9: Built Up Roof Expansion Joint Detail

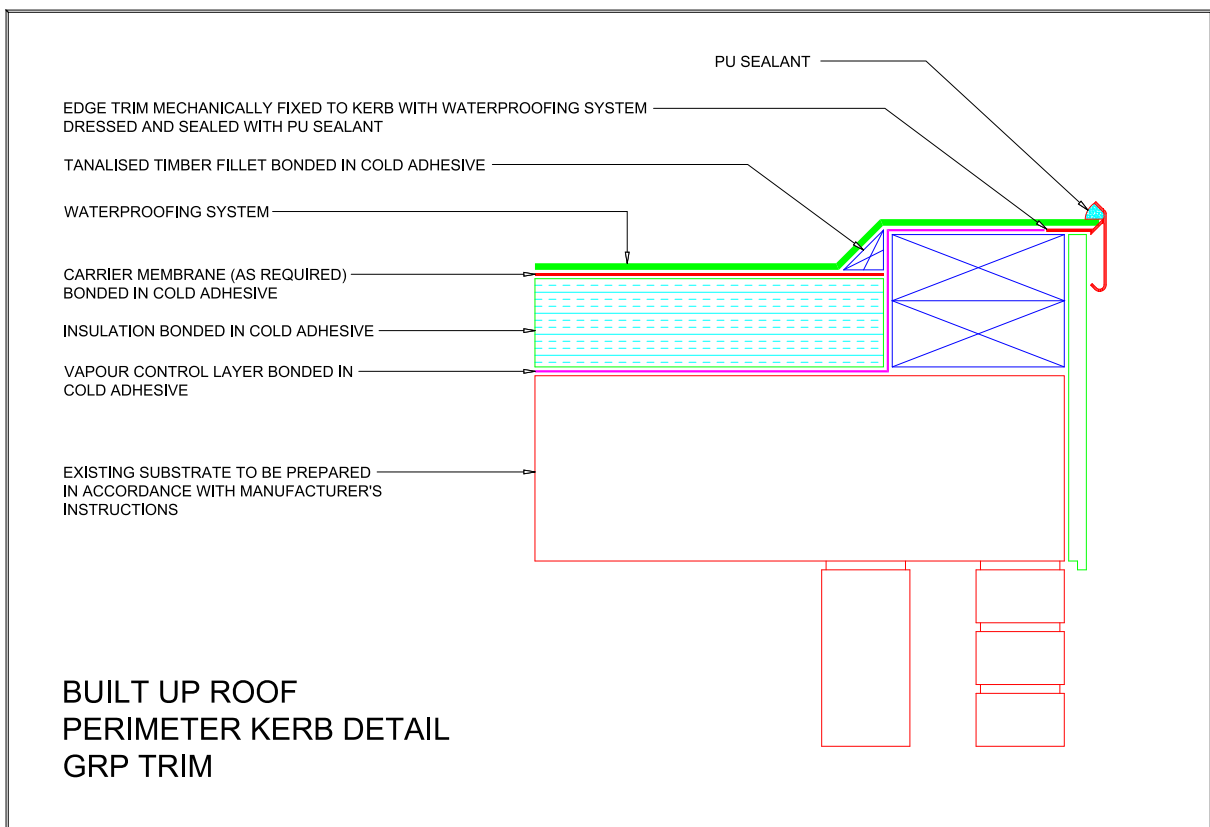


Fig 1

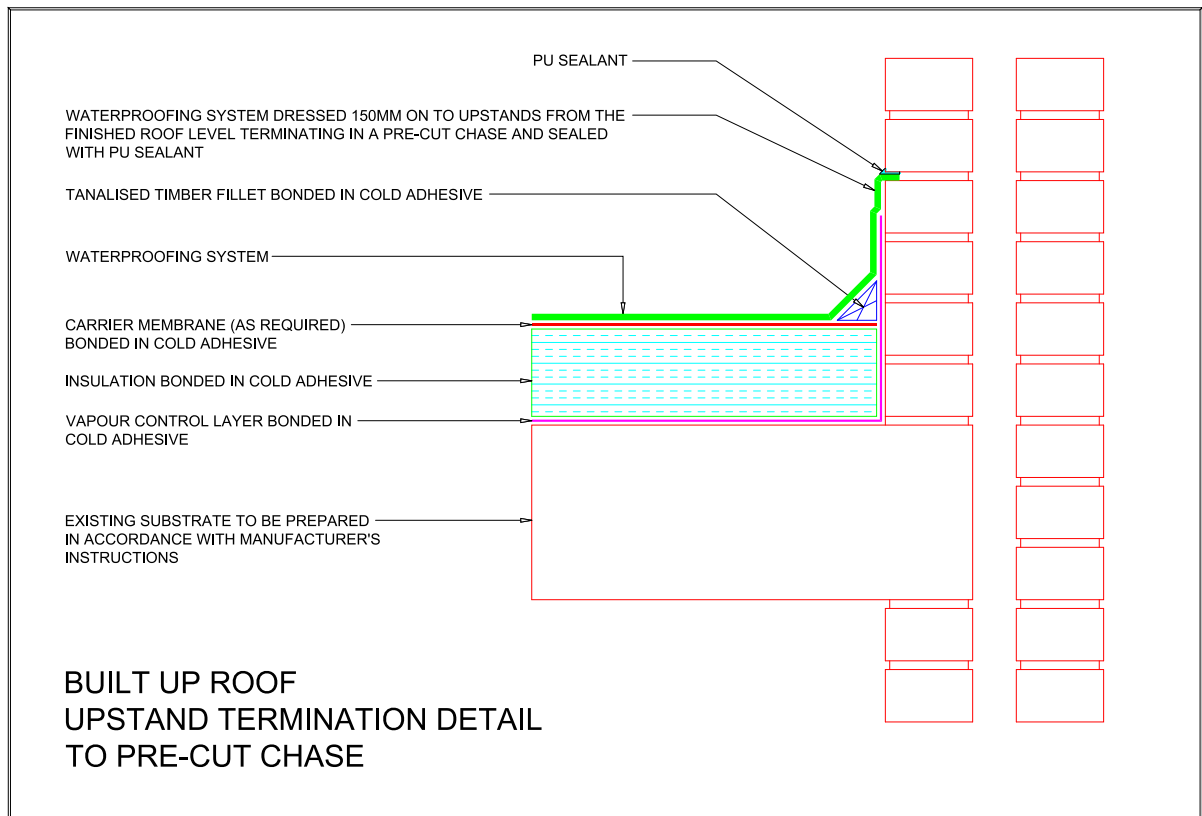


Fig 2

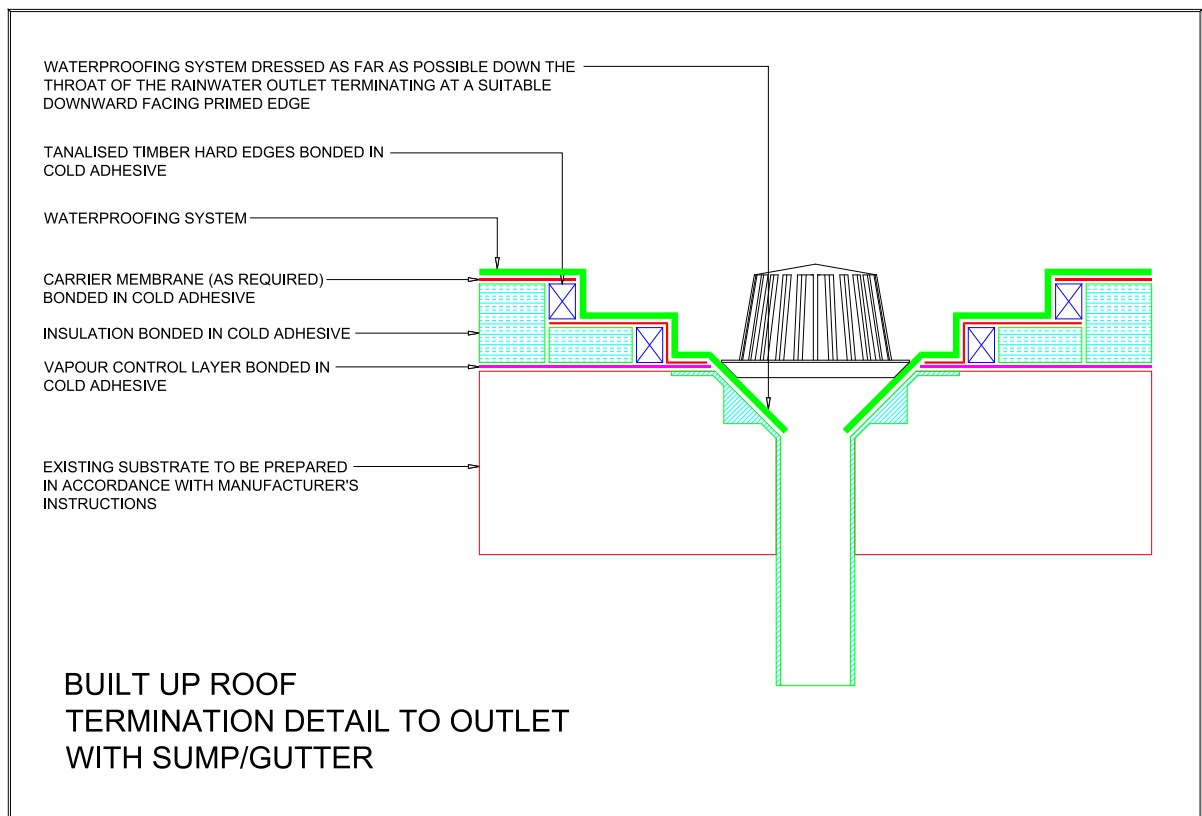


Fig 3

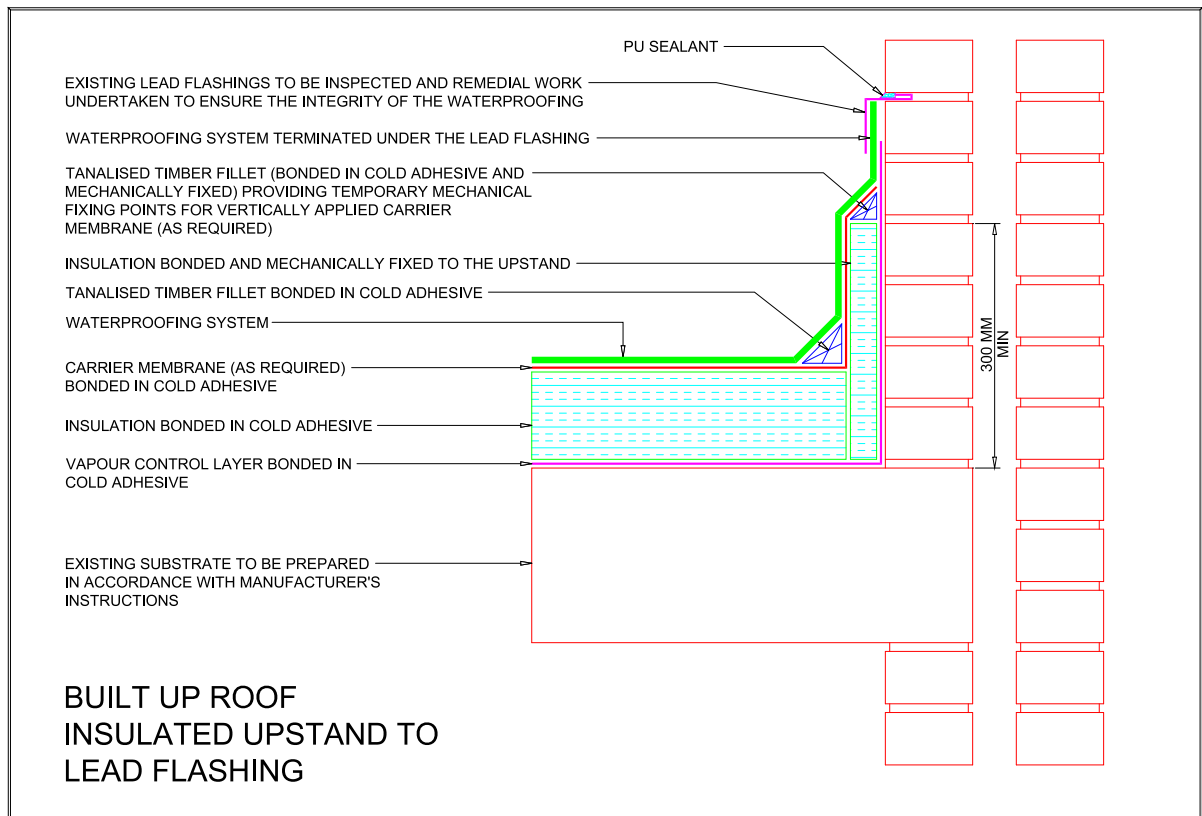


Fig 4

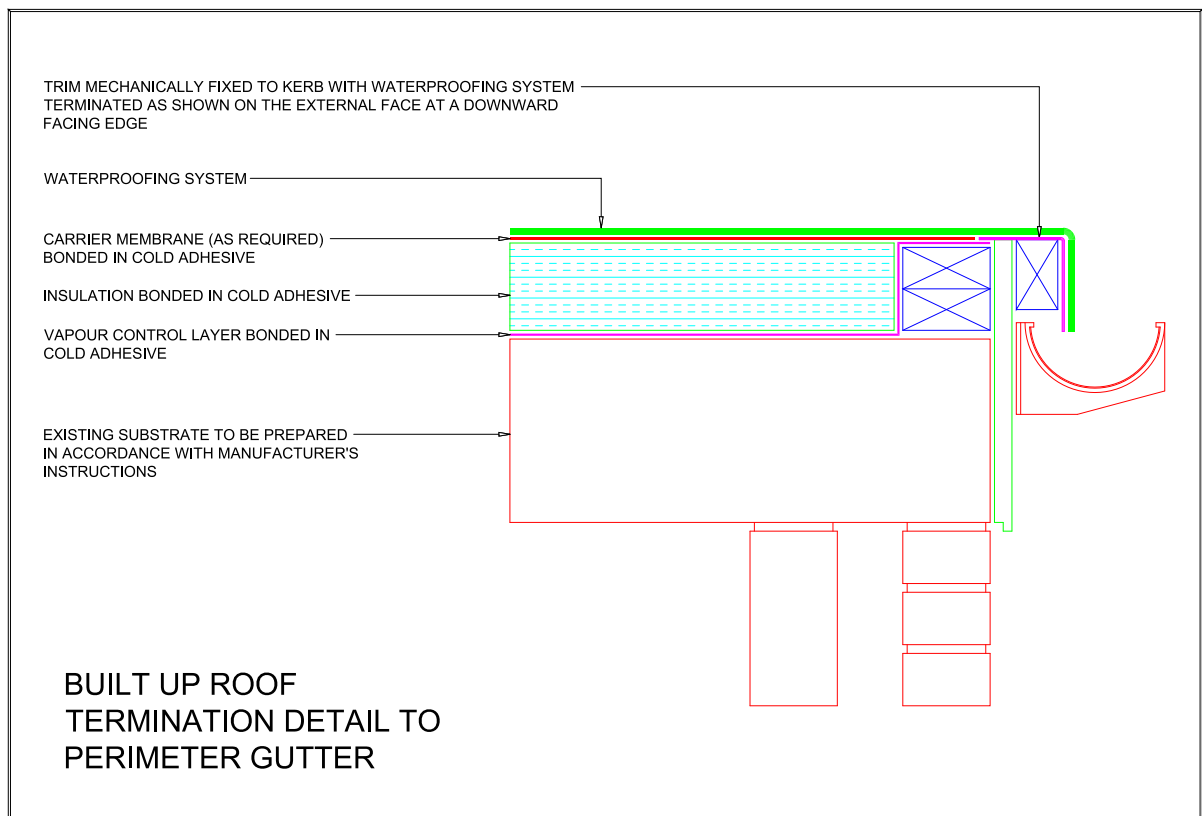


Fig 5

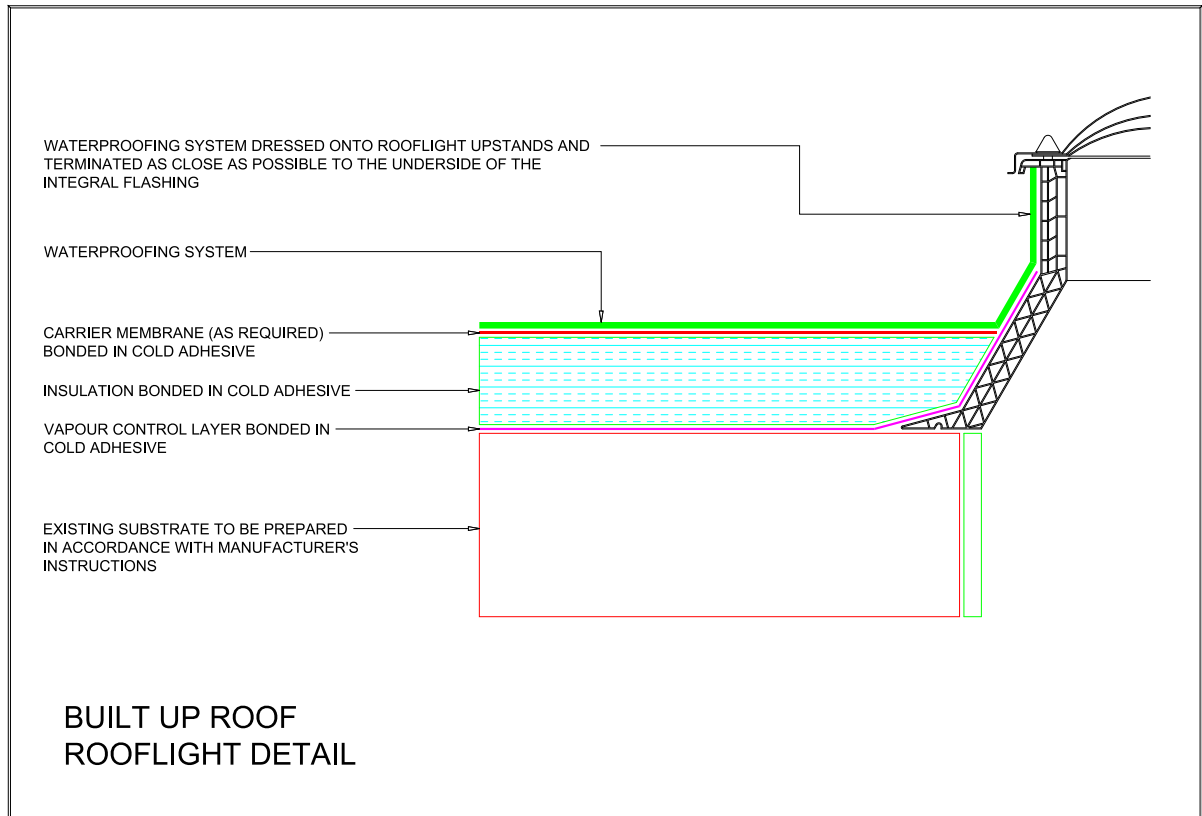


Fig 6

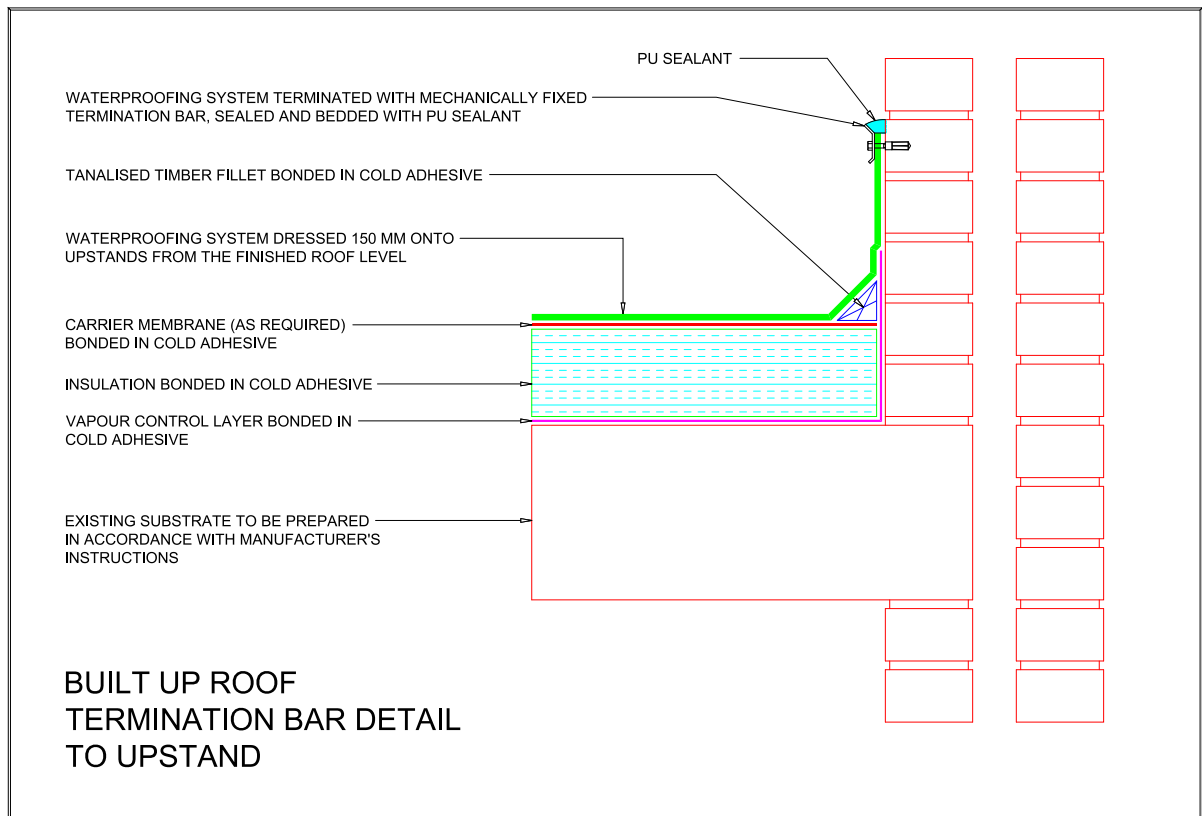


Fig 7

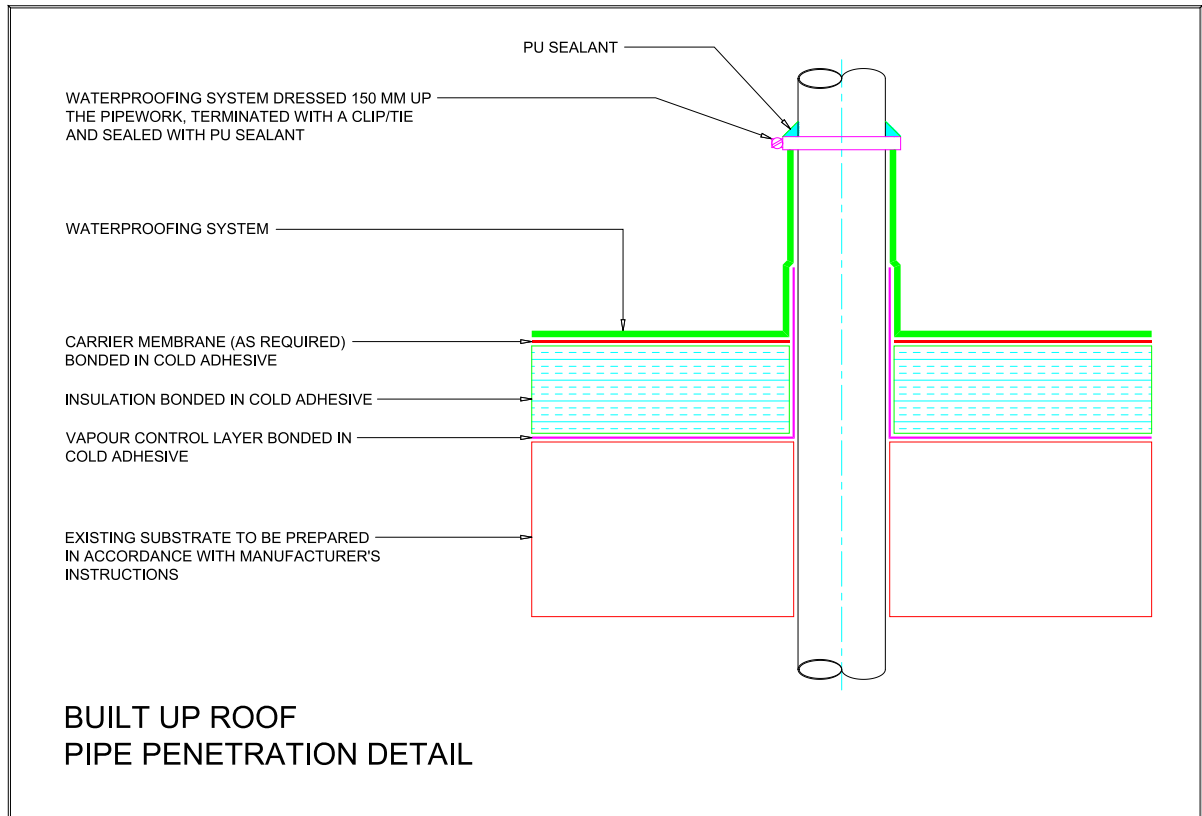


Fig 8

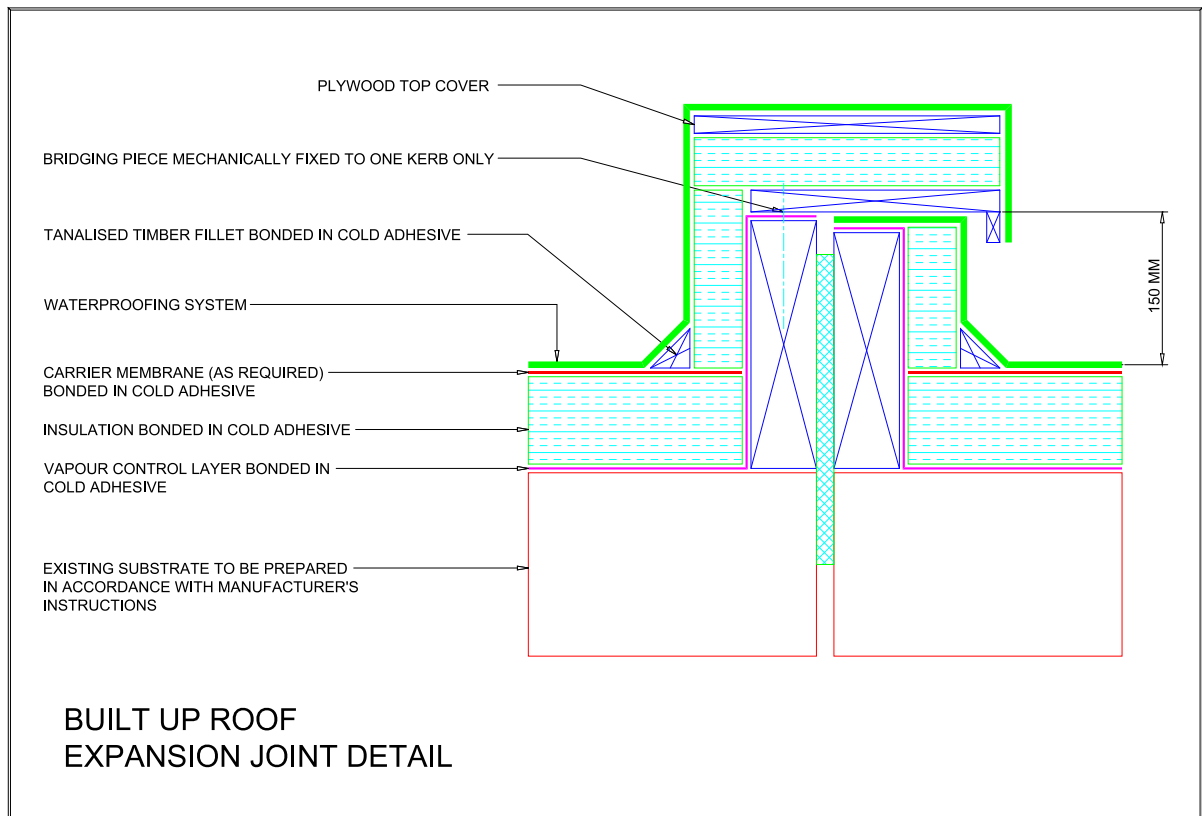


Fig 9

8 QUALITY CONTROL ON SITE

8.1 GENERAL

The selection of a suitable specification based on the particular set of circumstances which prevail on a roof, balcony or walkway is the first stage of a quality programme which will provide a durable system.

Particular attention should be paid to existing roofs, balconies and walkways and to the way in which they have failed, access, structural integrity, provision of damp courses on parapets, roof level equipment and any other client requirements.

The proposed specification should take account of the application requirement, Health and Safety needs, and the practicality of installation on each site. Quality control should be a consideration at design stage and a feasible programme established covering all aspects of the proposed work.

It is important that scheduled quality control includes every stage of application including the preparation phase as post installation inspection is often difficult if not impossible.

Quality control should be considered as part of a full programme of organised work rather than an item to be isolated once the project is complete.

Unlike other forms of membrane which are produced under factory conditions liquid applied membranes are formulated for application on site. Installation should therefore be thought of as a succession of stages each of which require a quality control procedure. Particular note should be made of the weather prevailing during application and the effects of any interruptions to the application process caused by inclement weather.

The process would therefore include the following items:

1. Initial site survey and development of specification
2. Provision of suitably trained labour and supervision
3. Preparation of the substrata
4. Acknowledgement of surface profile and how it is to be dealt with
5. Carrying out of detail work involving the Liquid Applied Waterproofing Systems, e.g. around outlets, upstands etc and work in relation to flashings, gutters and minor building work
6. Primers and successive coats, including the formation of the wearing layer
7. Reinforcement within the system- overall or localised, and expansion joints (where necessary)
8. Coating thickness control measures for all "layers"

9. Evaluation of site applied check samples
10. Contractor/manufacturer site monitoring provisions during all stages of application, including any necessary installation testing deemed appropriate to the stages of the installation
11. Joint manufacture/contractor site inspection for guarantee purposes

8.2 COMPLETION

Completion should be considered as the final stage of this organised work programme, and as such not identified as a remote item at the end of the project. It should be thought of as the final check in a series of quality control and procedural processes. These would cover checks of the following items:

1. Adherence to the manufacturer's or specifier's specification
2. Logging of all material batch data obtained from packaging e.g. numbers, dates etc.
3. Execution of detail work, e.g. flashings, walkways, gutters, minor building work.
4. Once the substrates are covered it is not easy to establish such things as preparation, insulation and material usage there is, therefore, a need to review at all stages.
5. Film thickness may require checking - probably best established by material usage at all stages of application. Account should be taken of surface profile. Site applied check samples may require less evaluation. Wet film gauges can be used where appropriate.
6. Reinforcement - usage and overlap best checked at appropriate stage.
7. Film conditions during installation - i.e. freedom from pinholes, cure, and general appearance. All may be corrected at the appropriate time during system installation or by a final site snagging.
8. The use of various colours in a multi coat system will help in avoiding uneven membrane thickness and assist in achieving the required film build overall and thus help to show adherence to the specification.
9. If guarantees are involved then these will probably require inspection by both the manufacturer and the contractor as well as the client or their agent.
10. The site should be left clean and tidy - all cans, packaging, and equipment should be removed together with scaffold. (Scaffold may be left in place if required for final snagging inspection).
11. All rainwater goods and roof situated equipment, e.g. lightning conductors, power lines etc, should be left in appropriate working order. Such items should be checked by a competent person.

12. If the scaffold is tied with 'Hilti' bolts or similar, these may require removal and the holes plugged as the scaffold is removed.
13. It may be necessary to finally check for scaffold damage once this is removed.
14. Manufacture's/Contractor's guarantees should be sought for the Liquid Applied Waterproofing Systems.
15. The Operation and Maintenance Manual will require updating/completing prior to passing to the client for his retention.

9 MAINTENANCE

Guarantees for Liquid Applied Waterproofing Systems may last for many years, and it is therefore necessary to establish the appropriate maintenance schedule which should be adopted to ensure trouble free performance during its service life.

9.1 GENERAL MAINTENANCE

In normal use Liquid Applied Waterproofing Systems require no routine maintenance other than periodic inspections to check for damage by accidental impact or by building modifications involving the roof structure.

During the course of such inspections, sharp objects such as screws, stones, broken glass and other material should be removed from the surface in order to minimize the chances of accidental damage by subsequent foot traffic. In order to prevent damage by excessive localised loading, particularly on roofs incorporating soft insulation, planks or other simple load spreading devices should be placed under ladders or the supports of free standing structures on the roof.

Balconies and walkways will have a greater degree of foot traffic and the degree of wear and required maintenance will differ depending on the usage.

Guarantees/Warranties for roofs, balconies and walkways may also last for many years, and it is therefore necessary to establish the appropriate maintenance schedule and guidelines which should be adopted to ensure trouble free performance during its service life. This may be stipulated in the terms of the guarantee.

Consideration should be given to the need for an annual maintenance inspection to highlight any defects or damage, which can then be isolated for attention.

9.2 INSPECTIONS

Inspections should be carried out at least annually, however, inspections in spring should detect any winter damage and in autumn should ensure that any leaves and other debris are cleared. Roofs, balconies and walkways in close proximity to trees, subject to high dust or other pollutants or other high risk locations should be inspected more frequently.

The following is a list of typical roof details, although each individual roof, balcony or walkway may have other areas that require inspection.

General areas; remove leaves, paper, silt and any other extraneous debris. Cut back overhanging tree limbs.

Upstands, flashings, cappings, expansion joint covers and copings; check exposed membrane for any damage and ensure the components themselves, sealants, mastics and pointing are in good condition and effective.

Edge details, drips and waterchecks; check that edge details are properly secured to provide protection against wind uplift.

Upstand flashings at walls, kerbs and gutters; check exposed membrane for any damage and ensure flashings, termination bars, sealants, mastics and pointing are in good condition and effective.

Penetrations and Protrusions, pipes, rooflights and plinths; check exposed membrane for any damage and ensure sealants, mastics and clips are in good condition and effective.

Outlets, gutters and rainwater pipes; check for free flow of rainwater and remove any debris or other extraneous items. If grates are missing they should be replaced.

The requirements for the maintenance for inverted roofs are generally limited to inspecting exposed details and surfacing as the main area of the weatherproofing is protected by the insulation and ballast.

Note: Where sealants are used they may require a separate maintenance cycle.

9.3 REPAIRS

In the event of localised damage, or to reinstate a completely seamless barrier following structural modifications, repairs can be made quickly and easily by applying more of the appropriate coating to the affected areas. If treating small punctures, the surrounding membrane should be cleaned, primed if necessary and repaired by the application of additional material (usually by brush or roller). In all cases, care should be taken to restore the dry film thickness of the original membrane. The application of any repair or refresher coats should be executed in accordance with the manufacturer's specification.

9.4 REFURBISHMENT

Not all roof, balcony and walkway systems need to be replaced at the end of their initial design lives. They may have their durability extended by the application of additional coatings. This method of refurbishment is significantly more cost effective than conventional alternatives and will enable further long term cost savings and improved ecological use of the existing structure.

9.5 LONG TERM MAINTENANCE

Towards the end of the anticipated design life of the chosen system, the membrane should again be inspected. In practice, the actual durability of the roof, balcony or walkway systems will often far exceed the quoted lifespan and maintenance will not strictly be necessary for several years after the termination of the stated period. Nonetheless, it is recommended that the system be overcoated when it has reached the end of its design life in order to ensure effective and continuous protection against water ingress. In all cases, inspections should then be carried out regularly (annually for example) in order to check for signs of wear or excessive weathering.

NOTE: If the top coat was previously applied in a different colour to the underlying coat, this will serve as a guide to the need for recoating i.e., the coating underneath will begin to show through when the top coat wears thin.

As required during the original application, the application of any repair or refresher coats should be completed in full accordance with the manufacture's specification.

10 TRAINING

10.1 General:

The introduction of many new products into the liquid coatings market has meant that there is a considerable variety in the choice of materials to be applied to roofs constructed from a wide variety of roofing materials. To ensure that the materials being applied to the roof are to be allowed to function in the best possible way, it is essential that all persons concerned with the operation, from the estimator to the operative applying the material, have received training in the activities involved.

For any person who is asked to work upon a roof, training is a pre-requirement, not only in the application of the roof coating, but also in the identification of roof faults and the correction of faults prior to applying materials. It is also of paramount importance to both the company and the operative that safety training has been given before being allowed upon a roof. The operative must at all times work in a safe manner such that neither the operative nor the general public are put at risk during the preliminary work before applying roof coatings or during the roof coating operations.

The responsibility for training the workforce falls fairly and squarely upon the employing company and many manufacturers organise courses for operatives in the application of coating materials. Safety training for the operatives can either be conducted in-company or by an outside organisation, e.g. Construction Skills.

Schemes include:

- National Vocational Qualifications (NVQ's) for Liquid Applied Waterproofing Systems
- Specialist Apprenticeship Programme
- Experienced Worker Practical Assessment
- The Institute of Roofing
- Supplier training schemes for approved contractors
- Recommendations/specifications ex suppliers as part of training

11 READING REFERENCES

LRWA

Guidance Note No. 1 - Roof, Balcony and walkway Inspection for the Specification of LAWS'
Guidance Note No. 2 - Substrates for LAWS for Roofs, Balconies and Walkways
Guidance Note No. 3 - Generic types of LAWS for Roofs, Balconies and Walkways
Guidance Note No. 4 - Roof, Balcony and Walkway refurbishment using LAWS
Guidance Note No. 5 - Health & Safety Provision for LAWS on Roofs, Balconies and Walkways
Guidance Note No 6 - Safe use of LAWS

European Technical Approvals

ETAG 005 Guideline For European Technical Approval of Liquid Applied Roof Waterproofing Kits

- Part 1 General
- Complementary Parts 2-8
- Test Methods - known as Technical Reports and numbered from TR-001 - TR-011

Building Research Establishment

Digest 180: Condensation in roofs
Digest 312: Flat roof design - the technical options
Digest 324: Flat roof design - thermal insulation
Digest 370: Control of lichens, moulds and similar growths
Digest 372: Flat roof design - waterproof membranes
IP11/81: Maintenance of flat roofs
IP26/81: Solar reflective paints
IP19/82: Considerations in the design of timber flat roofs
IP13/87: Ventilating cold deck flat roofs
IP2/89: Thermal performance of lightweight inverted warm deck flat roofs
DAS 33: Flat roofs - built-up bitumen felt - remedying rain penetration
DAS 34: Flat roofs - built-up bitumen felt - remedying rain penetration at abutments and upstands

British Standards Institution

BS 476-3:2004: Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
BS 3690-2:1989: Bitumens for building and civil engineering. Specification for bitumens for industrial purposes
BS 4841-3:2006: Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end-use applications. Specification for laminated boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under built up bituminous roofing membranes
BS 5250:2002: Code of practice for control of condensation in buildings
BS 6100-6:2008: Building and civil engineering. Vocabulary. Construction parts
BS 6229:2003: Flat roofs with continuously supported coverings. Code of practice
BS EN 12056-3:2000: Gravity drainage systems inside buildings. Roof drainage, layout and calculation
BS 8000-4:1989: Workmanship on building sites. Code of practice for waterproofing
BS EN 1263-2:1998: Safety nets. Safety requirements for the erection of safety nets
Eurocode 1, Part 1-4, BS EN 1991-1-4 General actions – Wind actions

Other sources of information

- Construction (Design and Management) Regulations (CDM)
- Health & Safety at Work Act 1974
- HSG33 Health and safety in roof work
- Building Regulations
- NFRC Technical Bulletins
- Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 CHIP
- COSHH Regulations 1988

APPENDIX i**Roof Survey Assessment Form**

Project Name:		Survey Date:
Address:		Surveyed by:
		Tel:
		Email:
		Access via:
		Risk Assessment
Post Code:		Needed/Completed? Yes/No
		Weather:
Roof Name:		Area (m ²):
Tank / Lift Motor Rooms?		Area (m ²):
Height of Building (m):	Parapet Height (m):	Age of Roof:
	Main Area:	Tank / Lift motor Rooms / other (delete or list if other):
Roof Type:		
Warm/Inverted/Cold		
Waterproofing Type		
Core Sample(s): Yes/No		
Roof Build Up		
Notes / Comments:		

Indicate details on Roof Plan/Drawing Sheet

Item	Y/N	Description	Comments
Upstands			
Parapets			
Perimeters			
Drainage / falls			
Penetrations			
Rooflights			
Window sills / Door Thresholds			
Handrails / Balustrades			
Walkways			
Plant			

Items requiring special attention	Additional works

Indicate details on Roof Plan/Drawing Sheet

