Best Practice Guidance

Podium Decks and Buried Roofs

PCA
Property Care
ASSOCIATION

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Guidance Document
Podium Decks and Buried Roofs

1. INTRODUCTION

Although the construction of Podium Decks has been around for some time, the advent of using a basement roof structure to extend beyond the building line and under gardens has increased recently. It was recognised that a guidance document was required to differentiate between Podium Decks and Buried Roof structures and advise on correct design and installation techniques. There has been a significant increase in failures, which like all other waterproofing related failures, becomes costly to remedy when they are buried underneath complex fitments, expensive finishes and working or leisure surfaces.

2. DEFINITIONS

- **Podium Decks**
  A podium deck is a structural element that is an elevated platform or one that has a void underneath it. It may have supporting columns that do not pass through this structural element.
- **Buried Roofs**
  A buried roof is part of an under-garden structure and in most instances, tends to be part of a basement that extends beyond the line of the main elevations.
- **Flat Deck**
  A flat deck is defined as a deck (or platform) with a shallow pitch less than 10º to the horizontal, the disadvantage of this type of construction is that it will invariably lead to negative falls and ponding.
- **Warm Roof** (or warm deck construction)
  Has the principal thermal insulation placed above the structural deck, with a vapour control layer between the deck and the insulation.
- **Cold Roof** (or cold deck construction)
  Has the principal thermal insulation layer below the structural deck and the concept is usually concerned with roof structures which include an independent ceiling enclosing an air space between the deck and ceiling and incorporate a vapour control layer.

3. DESIGN AND BUILD PHILOSOPHY

All waterproofing elements must be considered at the construction design stage.

4. PODIUM DECKS

A podium deck can be used as an infill between and/or attached to building structures. The requirement to waterproof is to protect the parent substrate, allowing for usage of the deck and the protection of the area underneath (from definitions). Podium decks can be utilised for basement car parks, leisure spaces, balconies, patio terraces and gardens. A podium deck provides several options for usage by the building owner.

When waterproofing a podium deck, it is essential to know the usage of the building elements below as there may be different grades of waterproofing required as defined in BS8102: 2009 Table 2 - Grades of Waterproofing Protection.

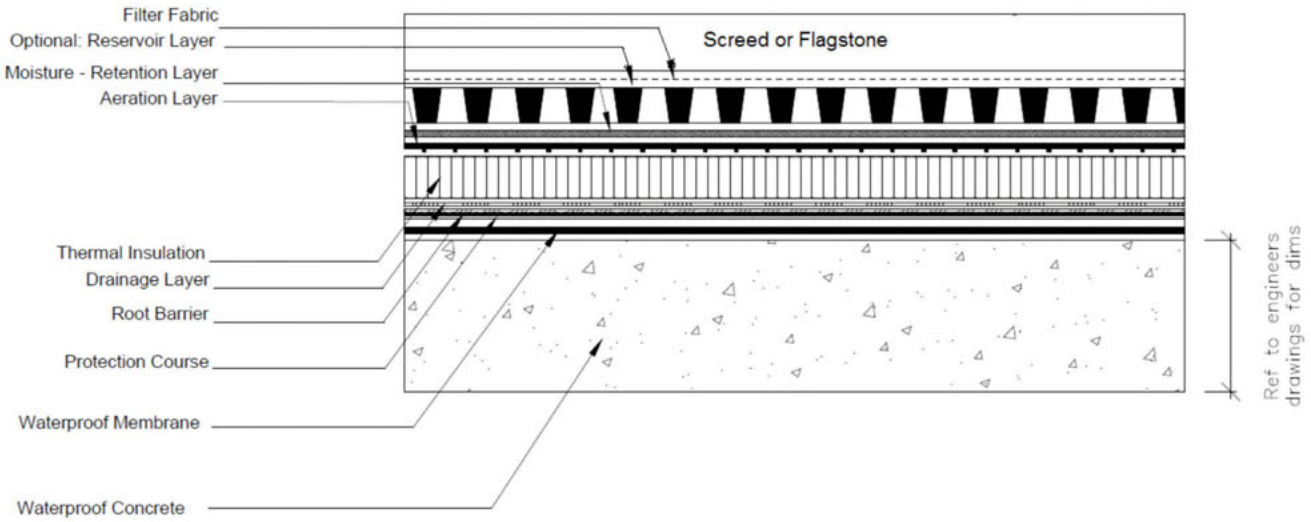
Each type of construction has its merits and drawbacks and the design of this element is key, depending on site conditions.

Podium decks constructed of reinforced concrete and correctly designed by an engineer have proven to be the most reliable. The substrate in all cases must be stable. When there is any risk for potential minor movement, vibration, or flexing to any degree, the best advice would be to consider applying elastomeric or flexible sheet type waterproofers and combinations of those materials suitable for proposed finishes on top of the deck.

Podium decks constructed of pre-cast concrete planks and block and beam floors have proven to be problematic to waterproof successfully.

Consideration should be made to applying screeds to adequate falls and drainage discharge points to provide a more uniform floor to accept the selected waterproofing system.

Ground Floor Podium Deck - Typical Detail



5. BURIED ROOFS (Extensive & Intensive)

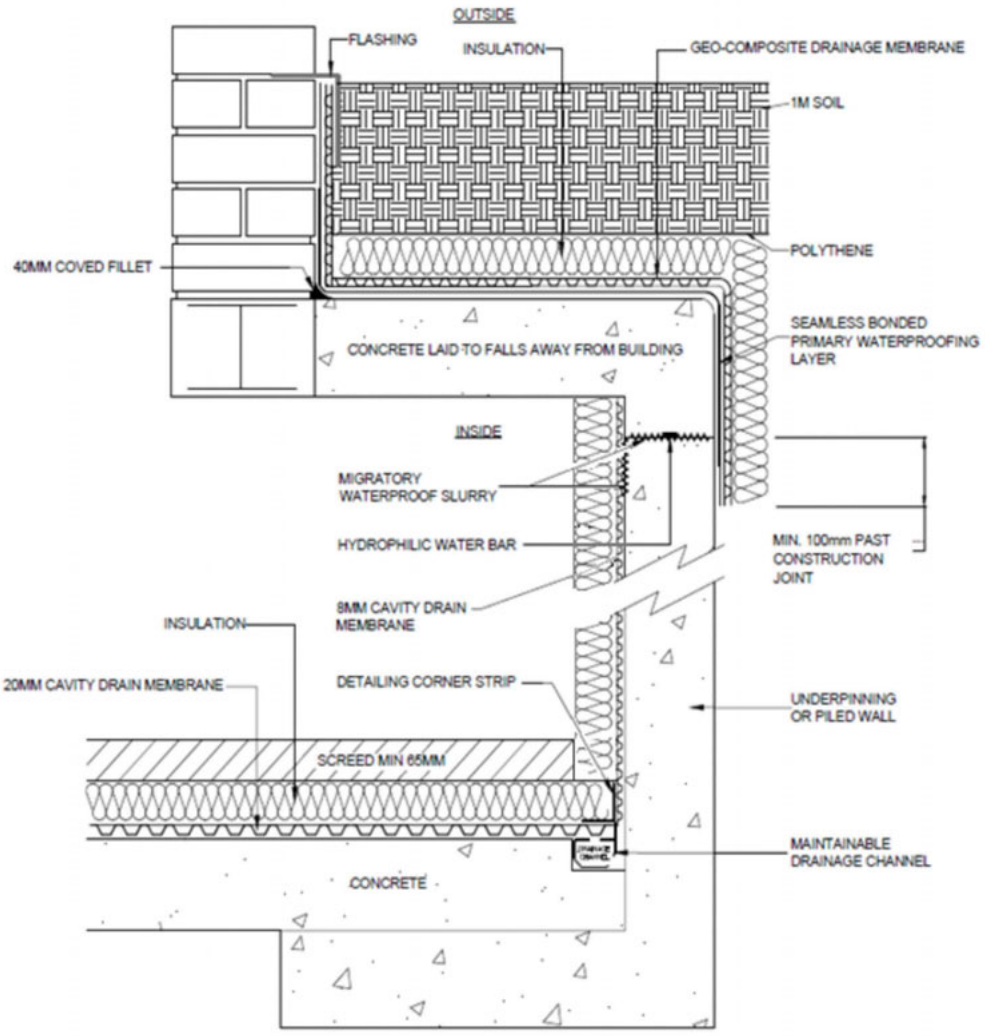
Buried roofs should not be confused with Podium decks, green roofs or other forms of suspended roof construction types.

Robust design should eliminate the potential for:
Sustained saturation of the built-up layers above the waterproofing and drainage elements.
Effective drainage must always be considered.

In the early days of retrofit basements and creating a Buried Roof, material built up above the Buried Roof (over the under-garden sections of basements) could be shallow and quite often had hard paved patio type surfaces. In recent years, however, there has been recognition of the need for depth of covering – e.g. some London Boroughs now insist on a minimum 1metre of soil coverage. This change in policy is to preserve green spaces and to help with water retention, reducing peak flows which put pressure on ageing drainage systems when soil has been replaced with hard surfaces.

Failure and leakage of buried roofs often originate at design stage. Sometimes engineers will specify inappropriate construction materials (from a waterproofing perspective) which can include:
block and beam, rib deck, hollow rib etc. and these have proven to be problematic to waterproof successfully. Waterproofing block and beam and other pre-cast individual elements and exposed steel beams have proven especially high risk and subject to failure.

Typical detail of a Buried Roof – not to scale.



Systems such as hollow rib and rib deck require support from steels, the steels in turn are supported by the head walls of the main basement structure and the supporting steel ends often have minimal concrete coverage. The steels can act as a conduit for water ingress and pathways are created as the concrete shrinks during the drying/curing process. Where steel meets concrete - thermal movement and other dynamic forces create pathways for water. When certain types of construction material are used, there is no simple/cost effective remedial repair solutions available.

When building tight to boundaries and even under sections of party walls (even garden boundary walls), there is no adequate access to the positive side of these basement lids where they interact with the heads of the basement walls. Often there is a gap in the waterproof envelope at what is the most critical joint in the construction. Designers can sometimes make the mistake that if the detail/junction can be drawn then it will be possible to achieve this on-site. The reality suggests otherwise, which is why a specialist waterproofing designer should be employed from the outset.

What can be done to make these designs more robust? Firstly, by influencing the design by advising engineers on suitable and appropriate materials used for construction. Also, the need to influence the position of construction joints and to use pre-formed cloaks on embedded steels.

6. DETAIL CONSIDERATIONS

Site inspection

- Concrete surface condition
- Contaminates
- Moisture, Temperature & RH as per manufacturer's datasheets
- Design compliance
- Structural movement
- Drainage arrangements
- Type of surface – preparation as per manufacturer's requirements
- Surface preparation – prior treatments, coatings, laitance

Drainage

There MUST be adequate drainage designed in the system. The design must be completed by a suitably qualified Professional. **Note - Any potential risk of ponding must be avoided!**

An overflow must always be included for a roof that is encapsulated on all 4 sides. This will allow for drainage should the outlets become blocked.

All overflow ports and drainage elements must be both accessible and serviceable to prolong their useful service lives. Reference to this all-important aspect should be made clear by the waterproofing designer from inception stage, for the drainage consultant to include within their design.

Minimum design requirements

A minimum finished fall of 1:80 is **advisable**. The build should be to 1:40 to achieve a minimum of 1:80 on site with falls towards suitable drainage outlets. Green roofs should have a fall of not less than 1:60 Minimum finished fall required in accordance to BS6229: 2003 is 1:80.

Recommendations for specific materials are as follows:

- Aluminium 1:60
- Copper 1:60
- Zinc 1:60
- Lead sheet 1:80
- Built-up bitumen sheet 1:80
- Mastic asphalt 1:80
- Single ply membranes 1:80

Design Considerations
Material suitability MUST consider climate and conditions, not only at design stage, but also at the application stages and recognising surface conditions, types of substrate (Concrete), loading and end finishes & fittings.

Construction and Movement Joints

- Movement joints can sometimes also require loading, which can be achieved by screeding, steel bracing and/or sometimes incorporating sliding bolts etc.
- Upstands

Terminations, Flashings, Tie-ins and interfaces with other systems such as:

- Waterproofing systems (external)
- Damp proof courses
- Damp proof membranes
- Service entry points
- Level changes
- Supports and guarding components

Installation
The installation requirement will be dependable on the material choice and specific manufacturers' advice should be followed and adhered to.

Substrate Prep
As specified by the product manufacturer.

Adequate drainage outlets should be allowed for on the podium to drain surface water off the deck. Spacings of which should be calculated by a specialist drainage consultant and in accordance with finishes over the selected waterproofing i.e. drainage capacity of 1m topsoil will differ dramatically over a 100mm mortar and paved area.

Cracks:
Static cracks should be repaired, with live cracks opened and sealed using suitable means.
Non-static cracks can be repaired with elastomeric types of waterproofing products

Choice of Waterproofing
There are many different types of materials that can be used to waterproof the deck. The choice will depend on the project requirements and will include:

- GRP, Seamless resins, epoxy, polyurethanes, polyurea's, MMA, some of which can be fast curing.
- Sheet membranes, bitumen based both hot and cold applied PVC and EPDM based sheets.
- Cement based coatings or crystallisation slurries.

Choice will depend on service life, durability, installation requirements or limitations, new or refurbishment, final use, application type, (hand, spray, rolled) etc. **Note: Design considerations and limitations must be recognised when using cementitious waterproofing for podium decks due to possible movement & differential shrinkage.**

Site Management & Logistics

- Cleanliness of surfaces
- Minimum Areas
- Site personnel Control and Management
- Protection from follow-on trades
- Weather Protection

Testing
As per manufacturers' guidance. When to test:

- After installation
- Before Finishes

Types of Testing
As per manufacturers' guidance:

- Visual inspection
- Water testing (prior to bunded water testing, approval should be given by the structural engineer).
- Electrical Testing

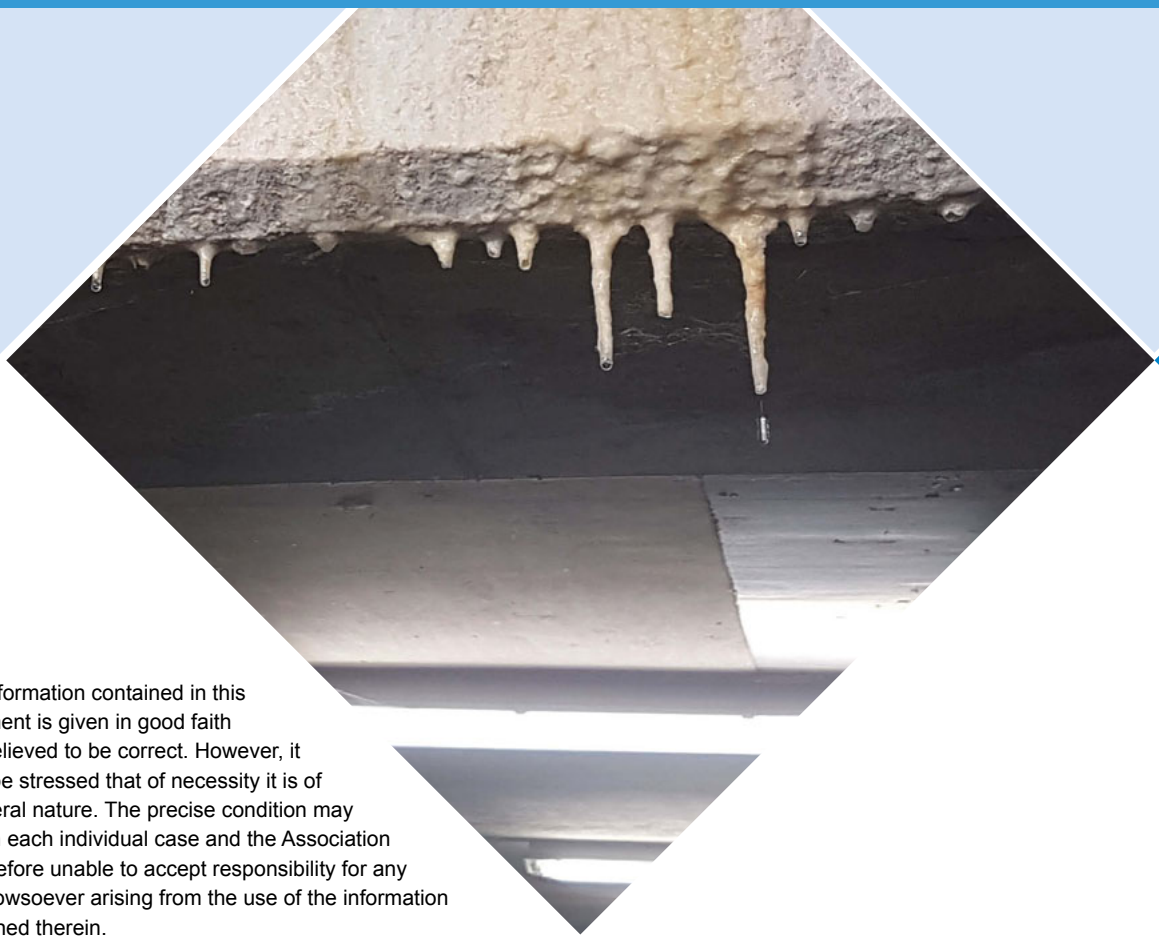
Defects and Repairs
Defects and repairs should be carried out in accordance with a product or systems manufacturer specification, as these will vary between differing types and forms of construction materials.

7. SOURCES OF INFORMATION AND GUIDANCE

BS6229: 2003 - Flat roofs with continuously supported coverings. Code of Practice
BS EN12056-3: 2000 - Gravity drainage systems inside buildings. Roof drainage, layout and calculation.
NHBC Chapter 7.1: 2010 – Flat roofs and balconies.
BS8102: 2009 - Code of Practice for protection of below ground structures against water from the ground.

This is a guidance note. Where recommendations are made for specific tasks, these are intended to represent 'best practice', i.e. recommendations that in the opinion of the PCA meet an acceptable level of competence. Although members are not required to follow the recommendations contained in the note, they should consider the content.

This guidance note is written and produced by the PCA Structural Waterproofing Group.



The information contained in this document is given in good faith and believed to be correct. However, it must be stressed that of necessity it is of a general nature. The precise condition may alter in each individual case and the Association is therefore unable to accept responsibility for any loss howsoever arising from the use of the information contained therein.

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