Technical Guidance Note

23.1 Concrete Deck Preparation

Concrete roof decks are a common substrate for flat roofing systems due to their high compressive strength, dimensional stability, durability, and superior fire resistance. They provide a rigid and durable platform suitable for a wide range of waterproofing systems, including bituminous membranes, liquid-applied systems, single-ply membranes, and inverted roof constructions. Concrete decks are widely specified for industrial, commercial, and large-scale residential developments where robust structural performance is required.

All concrete roof decks must be designed, detailed, and constructed in strict accordance with the relevant national and European standards and statutory requirements. Key references but not limited to include:

1) BS 6229:2018 – Flat roofs with continuously supported flexible waterproof coverings – Code of practice. This standard provides guidance on the design, construction, and maintenance of flat roofs to ensure effective thermal performance, drainage, and waterproofing integrity.

2) EN 1992 (Eurocode 2) – Design of concrete structures, which sets out the principles for the structural design of reinforced and prestressed concrete decks.

3) EN 1504 Series – Products and systems for the protection and repair of concrete structures, ensuring any repair, surface preparation, or protection works are conducted using compliant products.

Concrete roof decks must be properly prepared prior to the installation of waterproofing systems. Preparation should include curing, drying, and, if necessary, application of appropriate primers to ensure adequate adhesion and compatibility with the selected waterproofing system. Designers should also account for movement joints, thermal insulation compatibility, vapour control measures, and falls to ensure effective drainage.

It remains the responsibility of the designer to ensure that all aspects of the concrete deck construction and roofing specification are fully compliant with the latest versions of the applicable standards and regulatory frameworks.

Surface Regularity

MOY Waterproofing Systems require concrete roof decks and screeds to be prepared to defined surface regularity standards (SR2 finish within the UK and EN 13924, 1504-2, 1097-8 & EAD 030350-00-0402 within the EU). These standards outline a maximum permitted deviation of ≤5mm when measured using a 2m straightedge. Any areas identified that have larger deviations must be remediated to achieve the required standard.

Concrete decks that have been prepared to receive waterproofing systems must be even enough to allow continuous, void-free application of the waterproofing system. They should have an even surface - free from raised float marks or protruding aggregate that could lead to uneven coverage of liquid coatings or primers, or compromise adhesion. Any such imperfections must be ground flat before applying the waterproofing system.

Types of Concrete Roof Decks:

Cast In-Situ - The most common type of concrete roof deck is a cast in-situ deck. Freshly mixed concrete is poured directly onto a prepared formwork on-site and reinforced with steel rebar or mesh to enhance its tensile strength and prevent cracking. On larger roofs the concrete is often poured in sections. Once poured the concrete should be levelled and finished with a wooden float. Please note

a power floated or skip floated finish can produce a result that is too smooth to receive the waterproofing system and will often require additional surface preparation to be carried out.

Pre-Cast Concrete Planks – Hollow core or solid pre-cast slabs are factory manufactured and transported to site for construction. They are lifted into place and secured to the supporting structure. This method of construction results in joints between planks, these require sealing and grouting to both prevent water ingress and provide a suitable substrate to receive the waterproofing system.

On occasion, deviations in the supporting structure, differences between batches of planks and/or installation errors can lead to an inconsistent surface with raised edges at the plank joints. In instances such as this, it is recommended that a lightweight screed is installed – in line with the surface regularity standards noted above - to eliminate any deviations and provide a sound, consistent surface without any back falls.

Curing

The drying rate of concrete is influenced by multiple variables, with ambient climatic conditions and the water-to-cement ratio being the primary determinants.

Conventional concrete typically retains approximately 5% internal moisture once fully cured. In comparison, lightweight aggregate concrete—due to the pre-saturation of aggregates during production—exhibits a higher residual moisture content, which can contribute to prolonged drying times. Moisture level testing should be carried our by the main contractor/concrete supplier prior to the application of any waterproofing products.

Industry standards typically allow for in-situ concrete decks to cure for a minimum of 28 days, ensuring the concrete reaches its specified structural design strength prior to the application of any waterproofing system. The curing process can be extended by cool and damp conditions typically seen in the winter months.

Surface Hardness: Following surface preparation, cementitious substrates must exhibit a compressive surface strength exceeding 25 N/mm^2, as verified via rebound hammer testing to be carried out by a suitably qualified professional.

Cohesive Strength: The substrate must demonstrate a minimum cohesive tensile strength of 1.5 N/mm^2, confirmed through pull-off adhesion testing arranged by the main contractor/concrete installers. This ensures that the surface layer of the concrete has sufficient internal strength to resist delamination under load or environmental stressors.

Subject to the approval of the Principal Contractor, early installation of the waterproofing system may proceed prior to the full 28-day curing period, contingent upon a satisfactory visual inspection and the successful completion of adhesion testing, witnessed by a representative of MOY.

Adhesion Test Procedure

Prior to carrying out any adhesion test, the substrate should be free from dust and debris – this can usually be achieved using light mechanical brushing, however some areas may require jet washing to remove more stubborn contaminates.

The recommended method for assessing adhesion performance involves the application of the specified primer to the prepared substrate. Once the primer has adequately cured – refer to MOY Technical Data Sheet for specified product - a section of waterproofing membrane should be applied

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to the primed area using the specified bonding method.

The amount of adhesion tests required will vary depending on a variety of factors unique to each specific project. Multiple adhesion tests should be carried out for each separate concrete pour or roof section. Adhesion tests should focus on areas of high wind uplift in the corner and perimeter zones on each roof, with additional tests carried out in the field areas on larger roofs.

After allowing sufficient time for the system to cure, a manual peel test should be conducted. To initiate the test either cut a triangular section from the membrane using a suitable cutting tool or begin peeling from one corner.

A successful adhesion result is indicated when cohesive failure occurs within the membrane itself—i.e., the membrane tears or delaminates internally—rather than debonding cleanly from the primed substrate. This demonstrates that the bond strength between the membrane and the primer exceeds the internal cohesive strength of the membrane.

Fig. 1 - Reinforced Bitumen Membrane (Pass) – Membrane is showing a cohesive failure between layers indicating a strong adhesion to the concrete has been achieved.

Fig. 2 - Reinforced Bitumen Membrane (Fail) – Membrane and primer have peeled cleanly from the deck, indicating a failure in bond between the primer and concrete substrate.

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Fig. 3 Reinforced Bitumen Membrane (Fail) – Membrane has peeled easily from the deck with laitance visible on the reverse of the membrane.

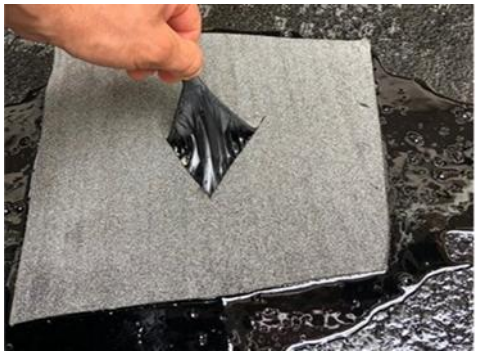

Fig. 4 - MOY Paromelt (Pass) – The MOY Paromelt Compound is displaying strong bond to both the concrete substrate and the MOY Paromelt Protection Layer.

Fig. 5 - MOY Paromelt (Fail) – The MOY Paromelt Compound and Primer have peeled cleanly from the deck, indicating a failure in bond between the primer and the concrete substrate.

Surface Defects and Their Impact on Adhesion Test Performance

Due to the high number of variables within the concrete pouring process it is often difficult to identify the specific reason for the failure of an adhesion test. Inadequate surface preparation is one of the primary causes of a failed adhesion test on a concrete roof deck. The presence of surface laitance—a weak, friable layer composed of fine cement particles and water residues that accumulate at the surface during curing. Similarly, surface dusting, characterized by the presence of loosely bound particles, can severely compromise the bond strength of adhered waterproofing systems.

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Contributing Factors to Surface Defects:

- Premature moisture loss: Rapid evaporation of surface water—particularly in warm, dry conditions—can negatively impact the structural integrity of the concrete, leading to surface weakness.
- Excessive bleed water: An elevated water-to-cement ratio at the surface due to bleed water migration can dilute the cement paste, resulting in a soft, powdery surface layer.
- Early-age frost exposure: Freezing conditions shortly after placement can damage the surface paste, reducing the structural integrity of the surface zone.
- Rainfall during initial curing: Precipitation shortly after concrete placement introduces excess moisture, disrupting the surface cement paste and increasing the effective water/cement ratio. This often manifests as surface dimpling or mottling.

Curing Practices and Their Influence on Adhesion

Improper curing techniques can adversely affect adhesion. In particular, the use of spray-applied curing compounds, especially wax-based formulations, can inhibit surface adhesion. If such materials are used, they must be completely removed prior to the installation of any waterproofing system.

Surface contaminants are a common yet often overlooked cause of adhesion failures during peel tests on concrete roof decks. These residues are typically leftover from construction processes or surface treatments that were not adequately cleaned or neutralized.

Sources of Surface Contamination

- Form-release agents: Used in concrete forming to prevent concrete from bonding to moulds or forms. These agents can leave behind oily or waxy residues.
- Curing compounds: Often applied to freshly poured concrete to retain moisture during curing. Many curing compounds contain oils, waxes, or silicates that inhibit adhesion.
- Tilt-up construction compounds: Used to ensure clean separation between casting slabs. Residual traces can persist even after cleaning.
- Sealers and coatings: Previous treatments intended to protect or harden the concrete may inhibit adhesion if not compatible with primers or membranes.

Surface Preparation Requirements

Defects such as laitance, dusting, and residual contamination compounds are typically limited to the surface but must be fully removed to ensure reliable adhesion. Surface preparation methods include:

- Light mechanical brushing or Compressed Air Blowing: Sufficient for minor laitance or dusting.
- Pressure Washing: Effective for lifting loose residues but may require additional cleaning steps to ensure dislodged dust, laitance and residues don't resettle on the substrate.
- Shot blasting or Scabbling: Recommended for more severe contamination or where stronger mechanical bonding is required.

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- **Wet/Dry Vacuuming:** To remove and prevent resettlement of any dust, laitance or contaminants that have been dislodged during the earlier stages of deck preparation.

Proper surface preparation is critical to achieving the mechanical and chemical bonding necessary for long-term waterproofing system performance.

Fig. 6 – Jet Wash Preparation

Fig.7 – Mechanical Preparation

Concrete Roof Decks and Tapered Insulation

Tapered insulation schemes are designed to create falls and promote drainage on flat roof decks. To ensure tapered insulation boards effectively deliver a consistent fall, the structural deck must be level and even. MOY recommend that a structural level survey is carried out on any flat concrete roof deck that is to receive a tapered insulation scheme. Any irregularities—such as hollows, depressions, or back falls—must be identified and corrected before installation commences.