



Bonneagar Iompair Éireann
Transport Infrastructure Ireland

TII Publications



Notes for Guidance on the Specification for Road Works Series NG 2000 - Waterproofing for Concrete Structures

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Document Attributes

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NRA DMRB and MCDRW References

For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

WATERPROOFING FOR CONCRETE STRUCTURES

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Waterproofing for Concrete Structures

NG 2001 General

- 1 The most opportune periods for installing waterproofing systems are the spring, summer and autumn when climatic conditions are most favourable.
- 2 Specification requirements for unformed finishes to concrete bridge decks are given in Series 1700.
- 3 Specification requirements for restrictions on curing liquids, compounds and membranes are given in Series 1700.
- 4 The use of ventilating layers, partial bonding or bond breakers is not permitted in the Specification as they provide an easy passage for water to pass under the membrane. The pumping action produced by the passage of vehicle wheels exacerbates the problem and leads rapidly to the general failure of the adhesion and disruption of the surfacing.
- 5 Fillets are generally formed in sharp internal angles to ensure minimum thickness of sprayed membrane in the angle.

Outgassing

- 6 The design of many bridge decks includes voids, which contain air, and air may be held within the concrete itself. This contained air can move in and out of voids with temperature and barometric pressure changes and such air movement through pores in the bridge deck top surface can cause pinholes in primers and thence blister the liquid applied membrane whilst in the partially cured condition.
- 7 Research has shown that the predominant cause of outgassing is a change in concrete temperature that gives rise to expansion of air in the pore structure of the concrete. The rate of outgassing is related to both the rate of temperature change and to the air permeability of the concrete. However it should be noted that outgassing occurs significantly more where primers containing solvents have been used, than from temperature changes alone. This is usually because the primer is not fully cured or set and excess solvent from the primer may still be present, which may then be activated when the membrane is applied (or subsequently when subjected to sunlight or the application of the asphalt). Care should therefore be taken to ensure that primers are set or fully cured in

accordance with the manufacturer's instructions before the application of the membrane.

- 8 Under the conditions which simulate outgassing it has been found that thin fast gelling membranes are most susceptible to blistering while the thin slower gelling membranes are most prone to pin/blow holing.

NG 2002 Protection of Bridge Deck Waterproofing During Construction

- 1 Before rubber tyred plant and equipment are allowed to travel on bridge deck waterproofing, it should be ensured that the surface is and remains, free of all loose materials and is stable enough to withstand traction forces.

NG 2003 Materials for Waterproofing Concrete Bridge Decks

Permitted Waterproofing Systems

- 1 As soon as possible after the Contract has been awarded, the Employer's Representative should ensure that the Contractor provides the NSAI Agrément Certificate or equivalent.
- 2 Should the Employer's Representative call for tests, it is important that uniform methods of testing be used. Details of the tests, test methods and criteria can be obtained from the NSAI or equivalent.
- 3 A bonding agent or liquid waterproofing membrane/adhesive has set or cured when it has become sufficiently stabilized to prevent movement of the waterproofing system during the laying of an additional protective layer or surfacing.
- 4 Unless otherwise described in the particular NSAI Agrément Certificate or equivalent, the primer should be thoroughly dry or cured before the membrane is applied. Where solvent based primers are used, any excess primer that has not been removed is likely to 'skin over' but give the appearance of being dry. The trapped solvent will expand rapidly under the application of hot bitumen and lead to failure of the membrane.

NG 2004 Materials for Waterproofing Below Ground Concrete Surfaces

- 1 There should be consideration as to whether the upper surface of buried concrete structures such as subways should be waterproofed with a material complying with Clause 2003 or whether materials complying with Clause 2004 are suitable for the purpose. NRA BD 57 sets the standard required.
- 2 Buried concrete structures which need to be waterproofed with a material complying with Clause 2003 should be identified on the drawings.

NG 2005 Workmanship for Waterproofing Concrete Bridge Decks

General

- 1 Prior to laying the waterproofing, the primed surface should be inspected and any entrapped aggregate or debris removed. Should the primed area be damaged it should be made good using the appropriate primer and allowing the necessary evaporation or cure time.

Blistering and Pin/Blow Holes

- 2 Moisture in the concrete deck, incomplete coverage by primer, unevaporated solvents in primers and general outgassing can lead to pin/blow holes (continuous or non-continuous) in liquid applied membranes. The waterproofing system and the additional protective layer should be covered as quickly as possible with the road surfacing in order to minimize the risk of blistering which is usually more prevalent in the late spring and early summer, during clear sunny weather.

Application of Waterproofing Into Angles, Including Chases

Spray Applied Membranes

- 3 With inadequate equipment or poor application technique there can be a tendency for sprayed coatings not to enter right into the angle but to build up thickness on the adjacent margins resulting in a thinning of the membrane in the angle. Spraying technique, material rheology and equipment can be selected to minimize these faults.

Vacuoles and pin/blow holes can also be caused by the above inadequacies.

Permitted Waterproofing Systems

- 4 The method of sealing the edges of the waterproofing system and around interruptions such as gullies should be shown on the drawings. Most manufacturers of permitted systems show examples in their marketing literature.
- 5 Before commencing each stage of installation the surface should be inspected, using the guide lines given in NG 2005.1, to check the complete evaporation of solvent, the removal of any entrapped aggregate or debris and that necessary repairs have been carried out.
- 6 Permitted waterproofing systems, including where necessary a tack coat and also the additional protective layer, should be covered without undue delay with road surfacing materials in order to minimise the risk of blistering. Should blistering occur, repairs should be in accordance with the NSAI Agrément Certificate or equivalent.
- 7 In considering the Contractor's additional information submitted with the NSAI Agrément Certificate or equivalent to cater for site conditions, the Employer's Representative may need to call for a site procedure trial to confirm the appropriateness of the waterproofing system to local site conditions.

Additional Bituminous Protection

- 8 When it is necessary for the additional protective layer to be trafficked by plant and equipment, e.g. where there is delay in surfacing, any damage is to be made good before surfacing is laid. The areas and thickness, normally 20 mm \pm 2 mm, should be shown on the drawings.

NG 2007 Integrity Testing of Concrete Bridge Deck Waterproofing

- 1 A method of integrity testing shall be included to verify the soundness of the waterproofing layer.

NG 2011 Repair and Replacement of Bridge Deck Waterproofing

- 1 Any additional requirements for the repair or replacement of bridge deck waterproofing systems should be described in Appendix 20/1. Issues that may need to be considered include:
 - (i) information on existing waterproofing systems;

- (ii) requirements for removal of existing surfacing;
- (iii) requirements for removal of existing bridge deck waterproofing or protective layer;
- (iv) requirements for examination of deck concrete by the Employer's Representative for testing or repairs;
- (v) requirements for preparation work; and
- (vi) requirements for the replacement waterproofing system.

NG Sample Appendices

NG SAMPLE APPENDIX 20/1: WATERPROOFING FOR CONCRETE STRUCTURES

[Note to compiler: This should include:]

- 1 Any restrictions on the use of proprietary materials for waterproofing below-ground concrete surfaces [2004.2].
- 2 Requirements for non-destructive integrity test(s) compatible with the water proofing system [2007.1].
- 3 Known details of existing waterproofing system where repair or replacement is required [2011].
- 4 Additional requirements for the repair or replacement of existing waterproofing systems [2011].

[Note to compiler: Surfaces that deviate from a U4 finish may require further deck preparation and/or additional material over the amount specified in the NSAI Agrément Certificate or equivalent certification to ensure that a minimum of 2mm coverage is achieved.]



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