

INFRASTRUCTURE MALTA SPECIFICATION
FOR ROAD WORKS
SERIES IM/2000 (IMPLEMENTATION)
WATERPROOFING FOR CONCRETE STRUCTURES



*This Specification Series implements the requirements in
Subsidiary Legislation 499.57, Part II (New Roads and Road
Works Regulations) in accordance with the Agency for
Infrastructure Malta ACT XXVIII, CAP. 588, Part I*

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2000	WATERPROOFING FOR CONCRETE STRUCTURES.....	2
2001	GENERAL.....	3
2002	PROTECTION OF BRIDGE DECK WATERPROOFING DURING CONSTRUCTION	3
2003	MATERIALS FOR WATERPROOFING CONCRETE BRIDGE DECKS.....	3
	Permitted Waterproofing Systems.....	3
	Additional Bituminous Protection.....	4
2004	MATERIALS FOR WATERPROOFING BELOW GROUND CONCRETE SURFACES	4
	Primer for Bitumen.....	4
	Cut Back Bitumen.....	4
	Proprietary Materials	4
2005	WORKMANSHIP FOR WATERPROOFING CONCRETE BRIDGE DECKS	4
	Permitted Waterproofing Systems.....	4
	Additional Bituminous Protection.....	5
	Bond Between Additional Protective Layer or Surfacing and the Waterproofing System..	5
2006	WORKMANSHIP FOR WATERPROOFING BELOW GROUND CONCRETE SURFACES	5
	Priming for Bitumen	5
	Cut Back Bitumen	5
	Proprietary Materials	5
2007	INTEGRITY TESTING OF CONCRETE BRIDGE DECK WATERPROOFING	6
2008	REPAIR AND REPLACEMENT OF BRIDGE DECK WATERPROOFING	6
2009	WATERPROOFING WITH SPRAY APPLIED SYSTEMS	7
2010	WATERPROOFING BELOW GROUND CONCRETE	8
2011	TESTING REQUIREMENTS FOR SPRAY-APPLIED WATERPROOFING SYSTEMS....	8

2000 WATERPROOFING FOR CONCRETE STRUCTURES

2001 General

- 1 The surface finish for new bridge decks between parapet upstands and to top of buried structures to be waterproofed shall be Class U4 finish in accordance with sub-Clause 1708.4.
- 2 Existing waterproofing systems to bridge decks between parapet upstands are to be repaired or replaced in accordance with Clause 2008.

2002 Protection of Bridge Deck Waterproofing During Construction

- 1 On any structure, providing no damage results, plant and equipment all fitted only with rubber tyres may stand or travel on permitted waterproofing systems solely for the purposes of laying an additional protective layer or surfacing course on that structure.
- 2 Rollers shall not be permitted to stand or travel directly on the waterproofing system.
- 3 Where it is necessary for plant, equipment or traffic to stand or travel on a bridge deck that has been waterproofed with a permitted system before the laying of an additional protective layer, suitable temporary protection shall be provided. All such plant and equipment shall have its tyre treads regularly inspected and any embedded hard objects removed.
- 4 Temporary protection shall be provided where damage to the waterproofing, protective layer or additional protective layer could result from particular site traffic.
- 5 The protective layer of a permitted two-layer waterproofing system, or any protective layer additional to that included as part of a permitted waterproofing system, shall be laid immediately after the waterproofing layer's bonding agent has set or cured.
- 6 Where a waterproofing membrane also serves as an adhesive for the protective layer, any additional protective layer shall not be laid until the liquid waterproofing membrane/adhesive has set or cured.

2003 Materials for Waterproofing Concrete Bridge Decks

Permitted Waterproofing Systems

- 1 Permitted waterproofing systems incorporated in the Permanent Works shall comply with one of the following:
 - a) have a current UK BBA (British Board of Agrément) Roads and Bridges Agrément Certificate in accordance with the Guidelines for the Assessment and Certification of Waterproofing Systems for use on Concrete Decks of Highway Bridges;
 - b) have a current EOTA (European Organisation for Technical Approvals) ETA (European Technical Approval) certificate in accordance with ETAG (European Technical

Approval Guideline) 033 – Liquid-Applied Bridge Deck Waterproofing Kits approved by the Overseeing Organisation.

Prior to commencement of the Works the Contractor shall provide to the Overseeing Organisation a copy of the UK BBA Roads and Bridges Agrément Certificate or ETA equivalent appropriate to the work to be undertaken. The procedure shall be repeated for each subsequent operation either for a different system or a different location.

Additional Bituminous Protection

- 2 Bituminous protection where required as an additional protective layer, shall comply with MSA EN 13108-4 recipe type F surface course mixture designation 0/2 (HRA 0/2 F Surf 40-60 with a minimum binder content of 10% by mass) except that 5% \pm 0.5% of the total mix shall be inorganic red oxide and regarded as part of the filler content, where the additional protective layer is required to be tinted.

2004 Materials for Waterproofing Below Ground Concrete Surfaces

Primer for Bitumen

- 1 Primer for sealing concrete surfaces prior to waterproofing shall be compatible with the selected bitumen waterproofing material. The viscosity of the primer shall be such that it penetrates the concrete without forming a skin.

Cut Back Bitumen

- 2 Cut back bitumen shall comply with BS 3690-1:1989+A2:2008 (Class 4 to MSA EN 15322) of viscosity grade 50 seconds.

Proprietary Materials

- 3 Subject to any restrictions specified in Appendix 20/1, proprietary materials may be used.

2005 Workmanship for Waterproofing Concrete Bridge Decks

Permitted Waterproofing Systems

- 2 Permitted waterproofing systems shall be supplied and installed in accordance with the BBA Roads and Bridges Agrément or ETA (ETAG 033) certificate and the producer's method statement.
- 3 The formation of defects affecting the integrity of the membrane including pin/blow holes (continuous or non-continuous) and blisters in the waterproofing shall:
 - a) be made good by repair using the same material and in accordance with the producer's methodology before any subsequent layers are applied; or

- b) require the system to be replaced.
- 4 Permitted waterproofing systems shall be laid to follow the contours of the concrete surface. Laps, ridges and ripples in waterproofing sheeting, and peaks and steps at butt joints in waterproofing boards, shall not be greater than 10 mm in height.

Additional Bituminous Protection

- 5 Bituminous protection complying with sub-Clause 2003.2 shall be laid on the clean and dry substrate and compacted in accordance with Clause 901 to the areas and thickness shown on the Drawings.

Bond Between Additional Protective Layer or Surfacing and the Waterproofing System

- 6 The additional protective layer or surfacing laid on the waterproofing system shall be fully bonded to the system for the life of the system. The bond shall be achieved by either:
- a) the binder within the directly applied additional protective layer or surfacing; or
 - b) a separate tack coat which has been assessed by the BBA as part of the registration procedure and details of which are given on the BBA Roads and Bridges Agreement Certificate or approved equivalent.
- 7 Where the tack coat is of the type activated by the heat of the succeeding bituminous layer the rolling temperature of this layer shall be sufficient to ensure adhesion.

2006 Workmanship for Waterproofing Below Ground Concrete Surfaces

Priming for Bitumen

- 1 Unless otherwise described in Appendix 20/1 and prior to the application of the selected bitumen waterproofing, concrete surfaces shall be thoroughly sealed with an evenly applied primer. The primer shall be well brushed in and not allowed to pond in any depressions.

Cut Back Bitumen

- 2 For bitumen waterproofing two coats of cut back bitumen shall be hot applied at a rate of spread per coat of 0.6 litre/m². The first coat shall be allowed to dry before the second coat is applied.

Proprietary Materials

- 3 For proprietary materials the method of application, rate of spread, number of coats and other requirements for each system shall be as described in the product literature supplied by the manufacturer.

2007 Integrity Testing of Concrete Bridge Deck Waterproofing

- 1 Waterproofing systems to concrete bridge decks shall be tested where required in Appendix 20/1 in accordance with the requirements therein to verify the integrity of the waterproofing.

2008 Repair and Replacement of Bridge Deck Waterproofing

- 1 The repair and replacement of existing bridge deck waterproofing systems shall comply with the requirements of Clauses 2002, 2003, 2005 and 2007 and any additional requirements described in Appendix 20/1.
- 2 Existing bituminous bound flexible surfacing shall be removed by cold-milling (planing) in accordance with Clause 709.
- 3 Concrete and other materials shall be removed by methods accepted by the *Overseeing Organisation*. The work shall be carried out in a manner which does not damage or disturb any part of the existing structure that is to remain on completion of the waterproofing.
- 4 The existing waterproofing system shall be stripped by hand or mechanical means. The use of heat or solvents shall only be allowed with the approval of the *Overseeing Organisation*. The existing primer shall be removed by mechanical means. All horizontal concrete surfaces shall then be cleaned using recoverable abrasive blasting cleaning such as by Vacuum Blasting, not open blasting. Open blasting shall only be used on areas unsuitable for recoverable abrasive blasting cleaning and shall be agreed by the *Overseeing Organisation*.
- 5 All replacement waterproofing systems shall be compatible with the existing system with which they will be in contact. Written guarantees shall be sought by the *Contractor* to confirm the compatibility of new waterproofing membranes with existing for acceptance by the *Overseeing Organisation*.
- 6 Concrete surfaces which are to receive the replacement waterproofing system shall be cleaned of all oil, bitumen, contaminants and all elements of any previous waterproofing membrane and/or primer. Surfaces contaminated with lichens and vegetative growths shall be treated with a fungicidal wash of a type accepted by the *Overseeing Organisation* and rinsed with clean water to remove any residual traces of fungicide. Cement laitance shall be removed. It shall be noted that sub-Clause 2001.1 states the requirements for new structures. The Contractor shall not expect the concrete surface finish of the existing deck to be the same standard as for new structures or a U4 finish, but rather an unsmooth, non-uniform finish with defects and blemishes. Where a spray applied waterproofing system is to be used for the repairs, surfaces may require further preparation and/or additional material over the amount specified in the BBA Board and Bridges Agrément Certificate or ETA ETAG 033 equivalent to ensure that a minimum of 2 mm coverage of spray applied waterproofing membrane is achieved. Final preparation of all surfaces shall be by recoverable abrasive blasting cleaning.
- 7 Prior to the application of the new waterproofing, the deck concrete will be examined by the *Overseeing Organisation* who may instruct concrete repairs in accordance with Series 5700.

- 8 Immediately before the application of the primer or laying of the waterproofing system or protective layer, the concrete surface or primed surface shall be clean, dry and free from ice, frost, loose aggregate, dust and other debris. Written guarantees shall be sought by the Contractor to confirm the suitability of substrate with the waterproofing membrane and asphalt for acceptance by the Overseeing Organisation.
- 9 The waterproofing membrane, primer and bonding agents including tack coat shall be compatible with each other.
- 10 The use of ventilating layers, partial bonding or bond breakers with the waterproofing system is not permitted.
- 11 The replacement waterproofing system shall be a proprietary system complying with Clauses 2002, 2003, 2005 and 2007 or, where specified by the Overseeing Organisation or the design, a spray applied system in accordance with Clause 2009.
- 12 Where the existing waterproofing is a spray applied system, for repair areas of less than 2 m² at any one location, an accepted hand-applied system equivalent to and compatible with the existing may be used, subject to acceptance by the Overseeing Organisation.

2009 Waterproofing with Spray Applied Systems

- 1 Testing of spray applied waterproofing systems shall be as detailed in Clause 2011.
- 2 Waterproofing of bridge decks and fixed bridge joints using a proprietary spray applied membrane system shall be carried out strictly in accordance with the manufacturer's instructions.
- 3 The Contractor shall furnish the Overseeing Organisation with 3 copies of the Permitted Waterproofing System Data Sheet, at least two weeks prior to the application for acceptance by the Overseeing Organisation
- 4 Joints in the membrane shall be formed with laps and the use of adhesion promoters as recommended by the manufacturer in accordance with the BBA certificate or equivalent.
- 5 Except where the waterproofing membrane is to receive protective coating against ultraviolet light, a tack coat shall be applied as required by the manufacturer of the waterproofing membrane to bond it to the protective layer.
- 6 The strength of the bond shall be sufficient to prevent a shear failure, due to horizontal forces, from occurring along the interface of the waterproofing and the protective layer.
- 7 The waterproofing membrane shall have a protective coating, recommended by the manufacturer of the membrane, to protect it against ultraviolet light.
- 8 Waterproofing shall be applied only when the ambient temperature is 4° C and rising or above 4° C.

2010 Waterproofing Below Ground Concrete

- 1 Waterproofing material shall be at least two coats single part bitumen latex emulsion applied in accordance with the manufacturer's instructions.
- 2 The waterproofing system, in accordance with Clause 2004, shall be applied to:
 - a) the buried rear surfaces of the structure down to a level 150 mm below the construction joint;
 - b) the buried rear surfaces of end diaphragms of integral decks down to a level 200 mm below the soffit of the deck slab or construction joint, whichever is lower; and
 - c) other areas as shown on any structure-specific and general detail drawings.

2011 Testing Requirements for Spray-Applied Waterproofing Systems

- 1 Following deck preparation and before application of the primer, tests shall be carried out on random areas agreed with the Designer, to assess the adhesive strength of the cured primer and membrane to the deck. A minimum of 2 pull off tests shall be carried out on the waterproofing system per structure per visit.
- 2 The Contractor shall provide with each batch of material delivered to the site, a certificate showing that the material complies with the details given on the PWS data sheet.
- 3 Two samples of size at least 20 x 200 x 2 mm minimum thickness from material sprayed on to open moulds shall be provided and tested for tensile strength and elongation at break to BS 903 Part A2, and tear strength to BS 903 Part A3 method C. The Contractor shall supply the Overseeing Organisation with copies of the test results.
- 4 The coverage rate of material used shall be monitored continuously and the Overseeing Organisation shall be provided with daily sheets showing the weight of material used and the area covered for each period of spray operation.
- 5 The wet film thickness shall be monitored continuously using a comb type thickness gauge or pin gauge, and the Overseeing Organisation shall be provided with daily sheets showing the wet film thicknesses measured and their location. Where directed by the Overseeing Organisation, pieces of the fully cured membrane of size not less than 50 x 50 mm shall be cut out, to establish the dry film thickness and given to the Overseeing Organisation labelled with their location of origin.
- 6 The adhesion of the fully cured membrane to the deck shall be measured by two tests for each 100 m² of finished membrane or part thereof, or one test per spraying session if the sprayed area during the session is less than 50 m², at locations chosen by the Overseeing Organisation. Tests shall be carried out by a method accepted by the Overseeing Organisation and the apparatus used shall have a current certificate of calibration. The Overseeing Organisation shall be provided with the test results labelled with the location of the test site. Test values falling below 1.0 N/mm² shall require spraying operations to be suspended while

- further investigation is undertaken. Areas deemed not to meet this figure shall be removed and resprayed to the satisfaction of the Overseeing Organisation at the Contractor's cost.
- 7 The finished membrane shall be tested by the Contractor for pin holes and discontinuities and any imperfections detected shall be rectified in accordance with the BBA certificate or equivalent to the satisfaction of the Overseeing Organisation by the Contractor.
 - 8 Testing shall be carried out using a high voltage direct current detector. In addition to the manufacturer's instructions for use, the following requirements and conditions shall apply:
 - a) The instrument is to be operated above 13.5 kV.
 - b) The earth lead is not to be more than 10 m long.
 - c) Movement/expansion joints shall not be crossed when testing.
 - d) Earthing with screws set into substrate or exposed reinforcement shall be used.
 - e) When a leakage path has been found its position is to be marked with a permanent marker pen on the membrane.
 - f) The instrument is not to be used on wet or damp surfaces.
 - g) The equipment is to have a current certificate of compliance/calibration.
 - 9 All areas of membrane destroyed by testing shall be made good by a method accepted by the Overseeing Organisation.
 - 10 The minimum requirements the waterproofing system has to meet are as follow:

Table 2000-1: Adhesion Requirements

Adhesion Requirements	Temp (°C)	App 20/1 Requirement
		In All Situations
Shear bond test surfacing to waterproofing	-10	≥ 1.00 MPa
	23	≥ 0.50 MPa
	40	≥ 0.20 MPa
Tensile bond surfacing to waterproofing	23	≥ 0.50 MPa
Tensile adhesion test of waterproofing to concrete	23	≥ 1.0 MPa