

European Organisation for Technical Approvals
Europäische Organisation für Technische Zulassungen
Organisation Européenne pour l'Agrément Technique

Established pursuant to Annex II of the Council Directive 89/106 of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (Construction Products Directive)

ETAG 033

GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL of

LIQUID APPLIED BRIDGE DECK WATERPROOFING KITS

Version July 2010

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FOREWORD

Background of the subject

This Guideline has been drawn up by the EOTA Working Group 01.07/01 Liquid Applied Bridge Deck Waterproofing Kits (BRIDWATKIT)

The WG consisted of members from 6 EU countries [Belgium, Denmark, Finland, France, Germany and the United Kingdom (Convenor)] and one observer member from EFTA states [Switzerland].

It is important to distinguish between EOTA and CEN involvement in the area of Bridge Deck Waterproofing. EOTA deals with liquid-applied kits as described in the scope of this Guideline, whilst CEN deals with sheet materials. Existing CEN test methods are used as far as possible.

The Guideline sets out the performance requirements for BRIDWATKIT, the verification methods used to examine the various aspects of performance, the assessment criteria used to judge the performance for the intended use and the presumed conditions for the design and installation.

The general assessment approach of the Guideline is based on relevant existing knowledge and testing experience.

Reference documents

Reference documents are referred to within the body of the ETAG and are subject to the specific conditions mentioned therein.

The **list of reference documents** for this ETAG is given in Annex F. When additional parts for this ETAG are written afterwards, they may comprise modifications to the list of reference documents applicable to that part.

Updating conditions

Guideline

Subsequent amendment to or revision of a dated reference shall only apply to this ETAG when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to shall apply.

EOTA Technical Reports go into detail in some aspects and as such are not part of the ETAG but express the common understanding of existing knowledge and experience of the EOTA-bodies at that moment. When knowledge and experience is developing, especially through approval work, these reports can be amended and supplemented.

EOTA Comprehension Documents permanently take on board all useful information on the general understanding of this ETAG as developed when delivering ETAs in consensus by the EOTA members. Readers and users of this ETAG are advised to check the current status of these documents with an EOTA member.

EOTA may need to make alterations/corrections to the ETAG during its life. These changes will be incorporated into the official version on the EOTA website www.eota.be and the actions catalogued and dated in the associated **History File**.

Readers and users of this ETAG are advised to check the current status of the content of this document with that on the EOTA website. The front cover will indicate if and when amendment has taken place.

Section one:

INTRODUCTION

1. PRELIMINARIES

1.1. Legal basis

This ETAG has been established in compliance with the provisions of the Council Directive 89/106/EEC (CPD) and has been established taking into account the following steps:

- the final mandate issued by the EC : 03/02/2003
- the final mandate issued by the EFTA : 03/02/2003
- adoption of the Guideline by the Executive Commission of EOTA : 22/06/2010
- opinion of the Standing Committee for Construction : (indicate date)
- endorsement by the EC : (indicate date)

This document is published by the Member States in their official language or languages according to art. 11.3 of the CPD.

No existing ETAG is superseded.

1.2. Status of ETAG

a. **An ETA is one of the two types of technical specifications** in the sense of the EC 89/106 Construction Products Directive. This means that Member States shall presume that the approved Liquid Applied Bridge Deck Waterproofing Kits are fit for their intended use, i.e. they enable works in which they are employed to satisfy the Essential Requirements during an economically reasonable working life, provided that :

- the works are properly designed and built;
- the conformity of the products with the ETA has been properly attested.

b. **This ETAG is a basis for ETAs**, i.e. a basis for technical assessment of the fitness for use of a Liquid Applied Bridge Deck Waterproofing Kits for an intended use. An ETAG is not itself a technical specification in the sense of the CPD.

This ETAG expresses the common understanding of the Approval Bodies, acting together within EOTA, as to the provisions of the Construction Products Directive 89/106 and of the Interpretative Documents, in relation to Liquid Applied Bridge Deck Waterproofing Kits and uses concerned, and is written within the framework of a mandate given by the Commission and the EFTA Secretariat, after consulting the Standing Committee for Construction.

c. When accepted by the European Commission after consultation with the Standing Committee for Construction this **ETAG is binding** for the issuing of ETAs for Liquid Applied Bridge Deck Waterproofing Kits for the defined intended uses.

The application and satisfaction of the provisions of an ETAG (examinations, tests and evaluation methods) leads to an ETA and a presumption of fitness of a Liquid Applied Bridge Deck Waterproofing Kit for the defined use only through an evaluation and approval process and decision, followed by the corresponding attestation of conformity. This distinguishes an ETAG from a harmonized European standard which is the direct basis for attestation of conformity.

Where appropriate, Liquid Applied Bridge Deck Waterproofing Kits which are outside of the precise scope of this ETAG may be considered through the approval procedure without Guidelines according to Art. 9.2 of the CPD.

The requirements in this ETAG are set out in terms of objectives and of relevant actions to be taken into account. It specifies values and characteristics, the conformity with which gives the presumption that the requirements set out are satisfied, wherever the state of the art permits and after having been confirmed as appropriate for the particular product by the ETA.

2. SCOPE, USE CATEGORIES AND ASSUMPTIONS

2.1 Scope

This Guideline relates to Liquid Applied Bridge Deck Waterproofing Kits for use exclusively on concrete bridge decks. Kits used beneath ballast are not covered under the scope of this ETAG.

This Guideline covers liquid-applied bridge deck waterproofing kits, comprising in-situ applied liquids based on polymers (including resins). They are capable of being poured, spread or sprayed, in single or multi-layers, onto an existing surface of a bridge deck to provide, once cured, a continuous water-tight membrane.

Kits may include protective layers (e.g. bituminous or other sheet materials), reinforcements (e.g. polyester or glass fabrics) and/or other ancillary products (e.g. priming coats, tack coats).

Liquid applied bridge deck waterproofing kits are not intended to receive direct vehicular traffic in service and in this case will always be used beneath overlays of asphalt or concrete which may have a protective character and/or additional waterproofing function. These overlays do not form part of the scope of this Guideline but these will be taken into account in so far as they may affect, or are affected by, the performance of the waterproofing layer. Bridge deck waterproofing kits may remain uncovered when subject to pedestrian or cyclist traffic only or when used in non-trafficked areas.

Kits based on bitumen and polymer-modified mortars and kits with polymeric overlays are not covered under the scope of this ETAG.

2.2. Use categories/Product families/Kits and Systems

2.2.1 Sub-families

Currently available Liquid Applied Bridge Deck Waterproofing Kits are based on one or more of the following chemistries:

- Acrylics
- Epoxies
- Polyesters
- Polyureas
- Polyurethanes
- Water dispersible polymers.

2.2.2 Use Categories

In order to facilitate the assessment process the areas of use are categorised as follows:

- (A) With overlay and intended to receive vehicular traffic:
 - A.1 Overlay of coarse bituminous mixture applied at $(160\pm 10)^{\circ}\text{C}$ (CBM)
 - A.2 Overlay of mastic asphalt applied at 220°C to 250°C (MA)
 - A.3 Overlay of low temperature mastic asphalt (LMA) applied at a minimum temperature of $<220^{\circ}\text{C}$ (LMAMin) and maximum temperature $<250^{\circ}\text{C}$ (LMAmax)
 - A.4 Non-asphaltic overlays (see 2.3.5).
- (B) Without overlay (exposed) and intended to receive only pedestrian or cycle traffic.
- (C) Without overlay (exposed) and un-trafficked (including special case of un-ballasted rail bridges).

2.2.3 Levels and classes

There are no relevant levels or classes

2.3. Assumptions

2.3.1 General

The state of the Art does not enable the development, within a reasonable time, of full and detailed verification methods and corresponding technical criteria/guidance for acceptance for some particular aspects or products. This ETAG contains assumptions taking account of the state of the art and makes provisions for appropriate, additional **case by case approaches** when examining ETA-applications, within the general framework of the ETAG and under the CPD consensus procedure between EOTA members.

The guidance remains valid for other cases which do not deviate significantly. The general approach of the ETAG remains valid but the provisions then need to be used case by case in an appropriate way. This use of the ETAG is the responsibility of the ETA-body which receives the special application, and is subject to consensus within EOTA. Experience in this respect is collected, after endorsement in EOTA-TB, in the ETAG-Format-Comprehension document.

2.3.2 Usage range of temperatures

The range of operational temperatures of the waterproofing layer is -40°C to +60°C. EN 1991-1-5 provides a correlation between the shade air temperature and bridge temperature component.

2.3.3 Condition of support

The support on which the waterproofing is applied shall have a surface texture of 0.3 mm to 1.5 mm. EN 1766: 2000, clause 7.2 or EN 13036-1: 2002 describe suitable methods for measuring surface texture.

The age of the concrete support is normally assumed to be in excess of three weeks and unless specific assessments have been made the cohesive strength of the concrete surface shall be greater than 1.5 MPa.

2.3.4 Weather conditions

The waterproofing system cannot be put in place during rain, hail or snow.

The support temperature shall be greater than 4°C and at least 3°C above the dew point, unless specific assessments have been made.

2.3.5 Non-asphaltic overlays

In the case of a concrete overlay, tests with overlay are not relevant.

2.3.6 Working Life

The working life aspect has been proposed in conformity with EC Guidance Paper F, *Durability and the Construction Products Directive*, by using performance based methods and/or descriptive solutions.

For bridge deck waterproofing systems an assumed economically reasonable working life of 25 years is deemed appropriate.

However, a clear distinction has to be made between the assumed economically reasonable working life for a system and the actual working life of a system in a works. The latter depends on many factors beyond the control of the producer, such as design, location of use (exposure), installation, use and maintenance.

The assumed working life must therefore not be interpreted as being a guarantee given by the producer.

3. TERMINOLOGY

3.1. Common terminology and abbreviations (see Annex A)

3.2. Terminology and abbreviations specific to this ETAG

Assembled system - a 'kit' after it has been installed in the works, see Guidance Paper C. For the purposes of these Guidelines an 'assembled system' excludes any overlays.

Coarse bituminous mixture – see EN 13375: 2004.

Component - a product which, when combined with one or more other products, makes up a 'kit', see EC Guidance Paper C (2002).

Possible components of kits are marked with '*'.

Components are available based on a range of chemistries. The most common ones are described in Annex C.

Control Plan – Confidential part of the ETA which describes the tasks for the manufacturer and the notified body.

Finish Layer (applies only to exposed systems)* – one or more layers of material (e.g. slate chips, or solar protective coating, etc) applied as a component of the liquid applied bridge deck waterproofing kit, i.e. as a top layer of the assembled system. The finish layer may have several functions, e.g. protection of the system against the effects of weathering or as an aesthetic finish.

Free film - a sample of the waterproofing layer prepared without any support, used for testing.

Internal Layer* – a layer of fabric scrim, non-woven mat of synthetic material, glass fibres or other material used as a component of the liquid applied bridge deck waterproofing kit. This layer may constitute a reinforcement.

Kit - . a special form of a "construction product" in the sense of the CPD. It consists of at least two separate "components" that are assembled on site. A kit becomes an "assembled system" when installed in the construction works. See also EC Guidance Paper C.

Limiting Values (LV) - a minimum or maximum value specified in the ETAG for a specific characteristic.

For characteristics with limiting values the NPD option is not allowed.

Liquid material – a material or a combination of materials that can be poured, spread or sprayed.

Low temperature mastic asphalt – mastic asphalt which is suitable to be applied at a minimum temperature < 220°C and a maximum temperature < 250 °C as given by the kit manufacturer.

Manufacturer's Technical Dossier – a collection of documents consisting of the design rules, the Manufacturer's installation instructions and the directions concerning maintenance and repair of the assembled system, on-site quality measures etc, relevant to a particular product or a range of products.

Mastic asphalt – see EN 13375: 2004.

Overlay – the layer applied directly over the assembled system, designed to receive vehicular traffic, provide protection or provide an additional waterproofing function.

Priming coat (primer)* - a layer applied to the surface of a support in order to promote adhesion between it and the waterproofing layer.

Protection layer* - one or more layers of materials applied on top of the waterproofing to control the effects of physical, mechanical and/or chemical stresses. Examples are surface treatment and separation sheet.

Reinforcement* - a layer (e.g. a mesh or fleece) incorporated within the waterproofing layer to provide enhanced physical properties.

Sample – see Annex B3, clause 3.

Sealing Coat * - a priming coat (primer) that has the additional function of penetrating and sealing the support surface to prevent the passage of moisture and / or gases.

Support - the concrete surface to which a kit is applied, including (where applicable) any repair or levelling treatments applied to the support surface.

Surface treatment* - one or more components that can be used to provide e.g. improved connection between the assembled system and the overlay, to provide a key, to enhance slip or shear or as a protection (e.g. protection layer or finish layer).

Tack Coat* - an additional layer applied as a top layer of the assembled system in order to promote adhesion between the assembled system and the overlay.

Test categories - test categories are defined within the text of chapter 5 and are summarized in Annex D. They are related to the conditions for sample preparation (P), with stress conditions before testing (S) and with temperature conditions for testing (T). The Member States national regulations may refer to test categories.

Test Specimen – see Annex B3, clause 3.

Total system - a sample of an assembled system, with the addition of a relevant overlay, used for testing.

Waterproofing layer* - one or more cured layers of liquid applied components of a kit that provide the primary function of preventing the transmission of moisture into the support.

Section two:

GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE

GENERAL NOTES

(a) Applicability of the ETAG

This ETAG provides guidance on the assessment of Liquid Applied Bridge Deck Waterproofing Kits and their intended use(s). It is the manufacturer or supplier of the kit who defines the kit for which he is seeking ETA and how it is to be used in the works and consequently, this would determine the scale of the assessment.

(b) General lay out of this section

This section covers the requirements for the assessment of the fitness of Liquid Applied Bridge Deck Waterproofing Kits with regard to their fitness for intended use in construction works. The section is divided into the following chapters:

- Chapter 4 clarifies **the specific requirements for the works** relevant to the Liquid Applied Bridge Deck Waterproofing Products and Kits and uses concerned, beginning with the Essential Requirements for works (CPD art. 11.2) and then listing the corresponding relevant characteristics of Liquid Applied Bridge Deck Waterproofing Products and Kits
- Chapter 5: extends the list in chapter 4 into more precise definitions and includes the **methods available to verify** product characteristics and to indicate how the requirements and the relevant product characteristics are described. This is done by test procedures, methods of calculation and of proof, etc.
- Chapter 6 provides guidance on **the assessing and judging methods** to confirm fitness for the intended use of the Liquid Applied Bridge Deck Waterproofing Products and Kits
- Chapter 7, **assumptions and recommendations** are only relevant in as far as they concern the basis upon which the assessment of the Liquid Applied Bridge Deck Waterproofing Products and Kits is made concerning their fitness for the intended use.

(c) Levels or classes or minimum requirements related to the essential requirements and to the product performance (see ID clause 1.2 and EC Guidance Paper E)

This ETAG does not include classes. The relevant performance characteristics for the Liquid Applied Bridge Deck Waterproofing Products and Kits are determined using defined categories for test conditions. If, for some uses at least one Member state has no regulations, a manufacturer always has the right to opt out of one or more tests, in which case the ETA will state "no performance determined" against that aspect. This is not the case for those properties for which, when no determination has been made, the Liquid Applied Bridge Deck Waterproofing Kit does not any longer fall under the scope of the ETAG. Such cases shall be indicated in the ETAG.

(d) Working life (durability) and serviceability

The provisions, test and assessment methods in this Guideline or referred to, have been written, based upon the assumed intended working life of the Liquid Applied Bridge Deck Waterproofing Products and Kits for the intended use as described in clause 2.3.6, provided that the Liquid Applied Bridge Deck Waterproofing Products and Kits are subject to appropriate use and maintenance (cfr. ch. 7). These provisions are based upon the current state of art and the available knowledge and experience.

An "assumed intended working life" means that it is expected that, when an assessment following the ETAG-provisions is made, and when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

The indications given as to the working life of Liquid Applied Bridge Deck Waterproofing Products and Kits cannot be interpreted as a guarantee given by the producer or the Approval Body. They must only be regarded as a means for the specifiers to choose the appropriate criteria for Liquid Applied Bridge Deck Waterproofing Products and Kits in relation to the expected, economically reasonable working life of the works (based upon ID. par. 5.2.2).

(e) Fitness for the intended use

According to the CPD it has to be understood that within the terms of this ETAG, products shall "have such characteristics that the works in which they are to be incorporated, assembled, applied or installed, can, if properly designed and built, satisfy the Essential Requirements" (CPD, art. 2.1).

Hence, Liquid Applied Bridge Deck Waterproofing Products and Kits must be suitable for use in construction works which (as a whole and in their separate parts) are fit for their intended use, account being taken of economy, and in order to satisfy the essential requirements. Such requirements must, subject to normal maintenance, be satisfied for an economically reasonable working life. The requirements generally concern actions which are foreseeable. "(CPD Annex I preamble).

4 REQUIREMENTS

Requirements for works, and their relationship to the Liquid Applied Bridge Deck Waterproofing Kit's characteristics

This chapter sets out the aspects of performance to be examined in order to satisfy the relevant Essential Requirements, by:

- expressing in more detail, within the scope of the ETAG, the relevant Essential Requirements of the CPD in the Interpretative Documents and in the mandate, for works or parts of the works, taking into account the actions to be considered, as well as the expected durability and serviceability of the works.
- applying them to the scope of the ETAG (kit and where appropriate its constituent components, products and intended uses), and providing a list of relevant product characteristics.

When a characteristic or other applicable property is specific to one of the Essential Requirements, it is dealt with under that Requirement. If, however, the characteristic or property is relevant to more than one Essential Requirement, it is addressed under the most appropriate one with cross-reference to the other(s). Similarly, characteristics which have a direct bearing on one of the Essential Requirements and an indirect bearing on durability assessment are dealt with under ER 1, 3 or 4, with reference under 4.1.7. Where there is a characteristic which only relates to durability, this is dealt with in 4.1.7

4.0 Link between ER, relevant ID and Product Characteristics

The relevant Essential Requirements, the relevant paragraphs of the corresponding IDs and the related requirements to product performances are indicated in Table 1 below:

Table 1 - Link between ER, ID and kit characteristics

ER	Corresponding ID paragraph for works	Corresponding ID paragraph for product performance	Product Characteristic	ETAG paragraph on requirements
1	§ 4.2 Provisions concerning works or parts of them	§ 4.3 Provisions concerning products	Bond strength to support Capacity to bridge cracks Resistance to chloride ion penetration (if required) Resistance to dynamic actions: (Impact, fatigue, compaction and perforation) Resistance to heat impact Resistance to perforation Resistance to shear (to support) Water-tightness	4.1.1.1 4.1.1.2 4.1.1.3 4.1.1.4 4.1.1.5 4.1.1.6 4.1.1.7 4.1.1.8
3	§ 3.3.5 Outdoor environment	§ 4.2 Performance of products	Release of dangerous substances	4.1.3.1
4	§3.3.1.1 a falling after slipping b falling after stumbling/tripping §3.3.1.2 performance of the works §3.3.6 Accidents resulting from vehicle movement § 3.3.6.2 Performance of the works	§ 3.3.6.3 Relevant characteristics of the products	Bond strength to overlay Resistance to shear (to overlay) Slipperiness (exposed products only, related to use category)	4.1.4.1 4.1.4.2 4.1.4.3
Aspects of durability related to ER 1, ER 3 & ER 4			Retention of characteristics after exposure to: - water - heat ageing - oil, petrol, diesel, alkali, de-icing salts - Bitumen - UV (exposed areas only) - abrasion / wear (exposed areas only) - freeze / thaw	4.1.7.1
Aspects of serviceability related to ER 1, ER 3 & ER 4			High and low service temperatures Capacity to penetrate pores in the support (priming coats etc.) Resistance to flow (vertical surfaces) Applied thickness Effects of climatic conditions Quality of Support (moisture content, age.)	4.1.7.2

4.1. Kits (Assembled Systems)

4.1.1 Mechanical resistance and stability

4.1.1.1 Bond Strength (assembled system to support)

In order to maintain its integrity as a waterproofing layer the assembled system shall have sufficient adhesion to the concrete support to resist the forces acting upon it.

4.1.1.2 Capacity to bridge cracks

In order to maintain its integrity as a waterproofing layer the assembled system shall have sufficient strength to resist the forces and movement associated with cracks within the concrete support and the overlay.

4.1.1.3 Resistance to chloride ion penetration (if required)

The assembled system shall protect the concrete bridge deck by preventing the passage of chloride ions.

4.1.1.4 Resistance to dynamic actions

In order to maintain its integrity as a waterproofing layer the assembled system shall be capable of resisting the dynamic actions acting on it during application of overlays and in use. The actions to be taken into account include; actions due to traffic (compaction, compression, impact) and actions due to the movement of the bridge deck and/or overlay (fatigue, movement, cracking).

4.1.1.5 Resistance to heat impact

For systems that will be subject to a hot-applied overlay, (coarse bituminous mixture or mastic asphalt) the effect of the heat impact resulting from the application of the overlay shall be verified.

4.1.1.6 Resistance to perforation

In order to maintain its integrity as a waterproofing layer, the assembled system shall be capable of resisting perforation both before and during application of the overlay and where the assembled system is exposed during use.

4.1.1.7 Resistance to shear (assembled system to support)

In order to maintain its integrity as a waterproofing layer, the assembled system shall be capable of resisting the shear forces between the assembled system and support due (for example) to traffic or differential thermal movement.

4.1.1.8 Water-tightness

The assembled system shall protect the concrete bridge deck by preventing the passage of water.

4.1.1.9 Compatibility of materials in contact

These aspects are considered under 4.1.7.1.

4.1.2 Safety in case of fire

Not Relevant

4.1.3 Hygiene, Health and the Environment

4.1.3.1 Release of dangerous substances

The kit must be such that, when installed according to the appropriate provisions of the Member States, it allows for the satisfaction of the ER3 of the CPD as expressed by the national provisions of the Member States and in particular does not cause harmful emission of toxic gases, dangerous particles or radiation to the indoor environment nor contamination of the outdoor environment (air, soil or water).

4.1.4 Safety in use

4.1.4.1. Bond strength (assembled system to overlay)

The assembled system shall have sufficient bond strength to overlays specified by the kit manufacturer to avoid detachment in service.

4.1.4.2 Resistance to shear (assembled system to overlay)

The assembled system shall have sufficient resistance to shear to any overlay to avoid detachment in service.

4.1.4.3 Slipperiness

The assembled system, when exposed and with pedestrian or cyclist access, shall have sufficient coefficient of friction under the conditions likely to be found in the works to avoid the risk of pedestrians falling after slipping.

4.1.5 Protection against noise

Not Relevant

4.1.6 Energy economy and heat retention

Not Relevant

4.1.7 Aspects of durability, serviceability and identification

4.1.7.1 Aspect of durability

The assembled system shall have sufficient resistance to the effects of deleterious actions to ensure that deterioration of materials and components during the intended working life does not significantly affect the performance of the liquid applied bridge deck waterproofing kit in relation to fulfilling all the Essential Requirements 1–6.

Deleterious actions to be taken into account are:

- Contact with water, alkali, oil, petrol, diesel, de-icing salts and bitumen (for systems in use category A)
- Climatic conditions including effects of heat ageing and freeze/thaw

- UV radiation (for systems in use categories B and C)
- Abrasion/wear (for systems in use category B).

4.1.7.2 Aspects of serviceability

The following aspect of serviceability necessary for the satisfaction of the CPD, and not covered by Sections 4.1.1 to 4.1.6, shall be taken into account:

- High and low service temperatures
- Capacity to penetrate pores in the support (priming coats)
- Resistance to flow (application to non-horizontal surfaces)
- Applied thickness
- Effects of climatic conditions on application
- The effects of the quality of the support (e.g. moisture content, age of concrete)

4.2 Components

4.2.1 Requirements for component(s), related to § 4.1.1 to 4.1.7.

The manufacturer shall declare the components that are included in the kit and define the component characteristics and other criteria to enable him to set up FPC and to manage changes.

The manufacturer will not have direct control of the assembled system but only of the components leaving the factory. Consequently it is essential that components are defined precisely in terms of characteristics that may affect the performance of the assembled system. The approved body shall satisfy itself that there is no risk that any variation in the composition of a component can influence the performance of the kit and may require additional component and/or system tests to be carried out as verification. Examples of component characterisation tests are given in tables 3 to 6 of this ETAG.

4.2.2 Aspects of Identification

The materials and components used in the liquid applied waterproofing kit shall be identifiable to the extent that their properties might influence the kit's ability to fulfill the Essential Requirements.

5. METHODS OF VERIFICATION

This chapter refers to the verification methods used to determine the various aspects of performance of the products in relation to the requirements for the works (calculations, tests, engineering knowledge, site experience, etc.) as set out in chapter 4.

The possibility exists to use existing data in accordance with the EOTA Guidance Document No 004 on "The provision of data for assessment leading to ETA".

Guidance on the type and methods of preparation of the test specimens to be used in these methods of verification is given in Annex B of this ETAG. The manufacturer shall describe the appropriate overlay(s), if applicable to be used with the assembled system and reference to these overlays will be made in the ETA. The main types of overlay envisaged in these methods of verification are asphaltic but other types of overlay may be used (e.g. concrete). Where concrete overlays are used, then tests for bond strength to overlay and shear strength to overlay are not required (see §2.3.5)

Due to the range of conditions of use within Member States, it is necessary to make use of test categories when assessing some aspects of serviceability and durability. The categories reflect differences in the test parameters for:

- conditions relating to sample preparation (P)
- sample conditioning (stress conditions) prior to testing(S)
- temperature at which the test is carried out (T)

Test categories are defined in Annex D together with a table which gives an overview of the links between characteristics and possible test categories. By use of test categories and the table in Annex D it is possible to develop a test program for a specific kit with respect to the requirements of the Member States in which the kit is intended to be used.

5.0 Adding verification methods to Table 1 in 4.0.

Table 2 - Verification methods

ER	ETAG paragraph on product performance	ETAG paragraph on method of verification	Specific ETAG clause on method of verification
1	4.1 Mechanical resistance and stability	Bond strength to support Capacity to bridge cracks Resistance to chloride ion penetration (if required) Resistance to dynamic actions (Impact, fatigue, compaction and perforation) Resistance to heat impact Resistance to perforation Resistance to shear to support Water-tightness	5.1.1.1 5.1.1.2 5.1.1.3 5.1.1.4 5.1.1.5 5.1.1.6 5.1.1.7 5.1.1.8
3	4.3 Hygiene, Health and the Environment	Release of dangerous substances	5.1.3.1
4	4.4 .Safety in use	Bond strength to overlay Resistance to shear to overlay Slipperiness (exposed products only, related to use category)	5.1.4.1 5.1.4.2 5.1.4.3
Aspects of durability related to ER 1 ,ER 3 & ER 4		Materials in contact Retention of characteristics after exposure to: - Water - Alkali - Oil, petrol, diesel, de-icing salts - Bitumen (for systems used with asphalt overlay) Climatic conditions including: - heat ageing - Freeze/thaw UV radiation (exposed areas only) Abrasion / wear (exposed areas only)	5.1.7.1.2 5.1.7.1.2.1 5.1.7.1.2.2 5.1.7.1.2.3 5.1.7.1.2.4 5.1.7.1.3 5.1.7.1.3.1 5.1.7.1.3.2 5.1.7.1.4 5.1.7.1.5
Aspects of serviceability related to ER 1 ,ER 3 & ER 4		High and low service temperatures Capacity to penetrate pores in the support (priming coats.) Resistance to flow (Non horizontal surfaces) Applied thickness Effects of climatic conditions on application Quality of Support (moisture content, age)	5.1.7.2.1 5.1.7.2.2 5.1.7.2.3 5.1.7.2.4 5.1.7.2.5 5.1.7.2.6

5.1 Assembled Systems

5.1.1 Mechanical resistance and stability

5.1.1.1 Bond strength (assembled system to overlay)

This test is required for all use categories using test specimens type 1.

The bond strength between the waterproofing layer and the concrete support shall be determined in accordance with EN 13596: 2004. The test shall be performed on a Type 1 specimen prepared in accordance with Annex B (modified EN 13375: 2004) under application conditions (P1).

After a curing time specified by the manufacturer, the test shall be carried out under test conditions (T5).

The general modes of failure are described following EN ISO 4624: 2003.

The mode of failure is expressed as the percentage area and site of fracture in the system under test, in terms of adhesive, cohesive or adhesive/cohesive failure.

The mode of failure may be described as follows:

A	= Cohesive failure of support
A/B	= Adhesive failure between support and first coat
B	= Cohesive failure of first coat
B/C	= Adhesive failure between first and second coat
-/Y	= Adhesive failure between final coat and adhesive
Y	= Cohesive failure of adhesive
Y/Z	= Adhesive failure between adhesive and test cylinder

5.1.1.2 Capacity to bridge cracks

The test is required for all use categories using test specimens 1, 4, or 5b depending on the monitoring test.

The capacity to bridge cracks in the concrete support shall be determined in accordance with prEN 14224: 2009.

The test shall be performed on a specimen Type prepared in accordance with Annex B under application conditions (P1) with stress conditioning before testing as defined below according to the use categories as follows:

(A) With overlay and intended to receive vehicular traffic

With specimen Type 1, before the crack bridging test:

- Heat impact according to clause 5.1.1.5 indirect method followed by heat ageing according to clause 5.1.7.1.3.1.

Or with specimen type 4 or 5b, before the crack bridging test:

- Heat impact according to clause 5.1.1.5 direct method followed by heat ageing according to clause 5.1.7.1.3.1.

A Type 4 or 5b specimen is used where the mastic asphalt overlay has an additional waterproofing function. In this case an additional saw cut shall be made in the upper side of the overlay corresponding with the saw cut in the base specimen (see Fig 1 below).

(B) Without overlay (exposed) and intended to receive only pedestrian or cycle traffic

With specimen Type 1, before crack bridging test:

- UV Radiation according to clause. 5.1.7.1.4

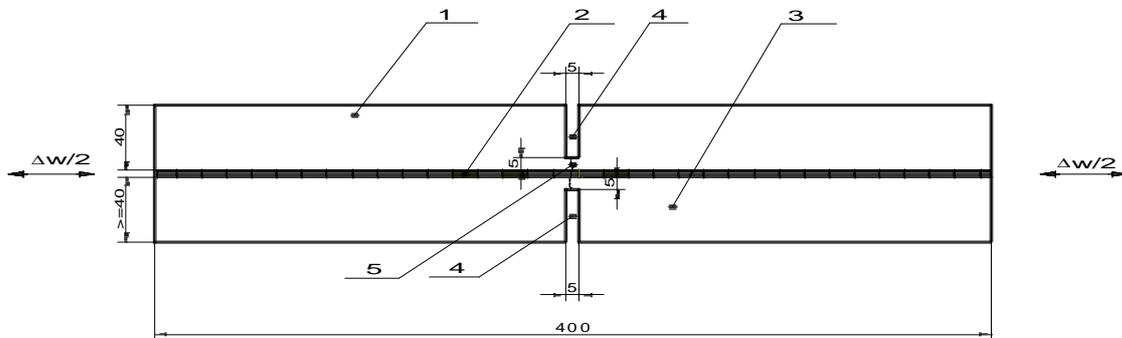
(C) Without overlay (exposed) and untrafficked (including the special case of unballasted rail bridges).

See (B) above

The test temperature is chosen by the manufacturer to satisfy the requirements of the Member States where the kit will be marketed and may be one of the following:

-30 °C, -20 °C, -10°C or 0 °C with an accuracy of $\pm 2^{\circ}\text{C}$.

Tests at lower temperatures cover tests at higher temperatures. Tests with a mastic asphalt overlay on specimen Type 4 cover tests on specimen type 5b. Tests with a mastic asphalt overlay (on specimen type 4 or 5b) cover tests without an overlay (specimen Type 1).



Note: All dimensions in mm

Figure 1 — Type 4 or 5b specimen with additional saw cut in the mastic asphalt overlay

Key to Figure 1:

- 1: Asphalt overlay with additional waterproofing function, i.e. mastic asphalt (MA) applied at up to 250 °C (type 4 specimen) or (LMA) <250 °C (Type 5b specimen)
- 2: Waterproofing layer
- 3: Concrete support
- 4: Saw cuts
- 5: Induced crack
- $\Delta w/2$: Half amplitude

5.1.1.3 Resistance to chloride ion penetration

This test is applicable for use categories (A) and (B) using specimens Type 1.

The resistance to the penetration by chloride ions of the waterproofing layer bonded to a concrete support (specimen Type 1 in accordance with Annex B under application conditions (P1) shall be determined in accordance with draft EOTA TR 022: 2007.

5.1.1.4 Resistance to dynamic actions

5.1.1.4.1 Resistance to compaction of a coarse bituminous mixture

This test is required for use category A.1 using specimens Type 2.

The free film is overlaid directly with a coarse bituminous mixture. (See EN 13375: 2004 for the definition of a coarse bituminous mixture).

The resistance to compaction of a coarse bituminous mixture shall be determined in accordance with EN 14692: 2005 (Method 2) with specimen described in EN 14692: 2005 in accordance with Annex B under application conditions (P1).

The compaction of the coarse bituminous mixture shall be carried out in accordance with EN 12697-33: 2003.

5.1.1.4.2 Resistance to fatigue and cracking

See 5.1.1.2

5.1.1.4.3 Impact resistance

See 5.1.1.4.1

Also see 5.1.1.6 that can provide additional information on resistance to impact by a sharp edged object.

5.1.1.5 Resistance to heat impact

This test is required for use category A, (A.1, A.2 and A.3).

The heat impact may be applied using, depending on the tests to follow, an indirect or direct method as described below:

i) Indirect method (specimen Type 1 or 2 in accordance with Annex B under application conditions (P1) depending on the monitoring test):

The heat impact is simulated using e.g. a ventilated oven, hot sand or hot oil. The following temperature profiles may be applied:

a) Heat impact to simulate the application of a coarse bituminous mixture at 170°C (CBM)

The surface temperature of the waterproofing layer is raised to $(140 \pm 5)^\circ\text{C}$ within ten minutes. This temperature is held for ten minutes followed by cooling to 40°C over two hours.

b) Heat impact to simulate the application of mastic asphalt at up to 250°C (MA)⁽¹⁾

The surface temperature of the waterproofing layer is raised to $(170 \pm 5)^\circ\text{C}$ within ten minutes. This temperature is held for ten minutes followed by cooling to 50°C over five hours.

c) Heat impact to simulate the application of low temperature mastic asphalt at a maximum temperature $< 250^\circ\text{C}$ (LMA_{max})⁽¹⁾

The surface temperature of the waterproofing layer is raised to $(\text{LMA}_{\text{max}} - 70)^\circ\text{C}$ within ten minutes. This temperature is held for ten minutes followed by cooling to 50°C over five hours.

(1) The manufacturer shall declare whether MA and/or LMA will be used with the kit and in the case of the latter the temperature range LMA_{min} and LMA_{max}.

The following tests shall be carried out after the heat impact is applied to comply with the appropriate thermal profile described under a), b) or c) above. Heat impacts at higher temperatures cover lower temperatures.

- Bond strength to the support on specimen type 1 (5.1.1.1)
- Tensile characteristics (tensile stress and elongation at tensile strength) on specimens type 2 according to EN ISO 527-2: 1996 (specimen 1B).

For Capacity to bridge cracks on specimen type 1 after additional heat ageing, see clause 5.1.1.2. (A).

ii) *Direct Method (specimens Type 3, 4 or 5 depending on the monitoring tests):*

Where specimens of type 3, 4 or 5 are prepared for the tests listed below, i.e. when an overlay is applied to the waterproofing layer at one of the overlay temperatures according to i) a, b, c above, the required heat impact conditioning may be deemed to have been satisfied.

- Resistance to shear to support on specimens type 3, 4 or 5b (5.1.1.7)
- Resistance to shear to overlay on specimens type 3, 4 or 5a (5.1.4.2)
- Bond strength to overlay on specimens type 3, 4 or 5a (5.1.4.1)
- Capacity to bridge cracks on specimen type 4 or 5b after additional heat ageing (5.1.1.2) (A).

5.1.1.6 Resistance to perforation

This test is required for use categories A, B and C and carried out on a specimen of Type 1 in accordance with Annex B under application conditions (P1) except that the substrate shall be steel.

Resistance to perforation shall be carried out in accordance with EOTA TR 006: 2004. The manufacturer shall declare the indenter size ($l_1 - l_4$)⁽¹⁾.

Note1: At present there is insufficient experience with this test for bridge deck waterproofing materials and it is left to individual Member States to set national requirements for indenter size.

Additional information on this characteristic may also be available from *Resistance to dynamic actions (5.1.1.4)* relating to use category A1 with coarse bituminous mixture and *Resistance to chloride ion penetration (5.1.1.3)* where available.

5.1.1.7 Resistance to shear(assembled system to support)

This test is required for use category A using specimen types 3, 4 or 5b.

The maximum shear strength between the waterproofing layer and the concrete support shall be determined in accordance with EN 13653: 2004. The test shall be performed on a specimen type prepared in accordance with Annex B (modified EN 13375: 2004) under application conditions (P1).

The application temperature of the mastic asphalt overlay shall be at 250°C (MA) unless the maximum temperature declared by the manufacturer is below 250°C (LMA_{max}) then the overlay shall be applied at the temperature LMA_{max} declared by the manufacturer.

The test shall be carried out at conditions (T5).

5.1.1.8 Water-tightness

This test is required for all use categories using test specimens type 2.

The water-tightness of the waterproofing layer shall be determined in accordance with EN 14694: 2005 but without any pre-treatment i.e. without impact perforation. .

The specimens shall be prepared in accordance with Annex B (modified EN 13375: 2004) under application conditions (P1)

5.1.2 Safety in case of fire

Not Relevant

5.1.3 Hygiene, Health and the Environment

5.1.3.1 Release of dangerous substances

5.1.3.1.1 Presence of dangerous substances in the kit or its components

The applicant shall submit a written declaration stating whether or not the kit or its components contains dangerous substances according to European and national regulations, when and where relevant in the Member States of destination, and shall list these substances.

5.1.3.1.2 Compliance with the applicable regulations

If the product/kit contains dangerous substances as declared above, the ETA will provide the method(s) which has been used for demonstrating compliance with the applicable regulations in the Member States of destination, according to the dated EU data-base (method(s) of content or release, as appropriate).

5.1.3.1.3 Application of the precautionary principle

An EOTA member has the possibility to provide to the other members, through the Secretary General, warning about substances which, according to Health authorities of its country, are considered to be dangerous under sound scientific evidence, but are not yet regulated. Complete references about this evidence will be provided.

This information once agreed upon, will be kept in an EOTA database, and will be transferred to the Commission services.

The information contained in this EOTA database will also be communicated to any ETA applicant. On the basis of this information, a protocol of assessment of the product, regarding this substance, could be established on request of a manufacturer with the participation of the Approval Body which raised the issue.

5.1.4 Safety in use

5.1.4.1. Bond strength (assembled system to overlay)

This test is required for use category A using test specimens types 3, and/or 4 and/or 5a.

The bond strength between the waterproofing layer and the overlay shall be determined in accordance with EN 13596: 2004. The test shall be performed on a specimen type prepared in accordance with Annex B, under application conditions (P1).

The application temperature of the mastic asphalt overlay shall be at 250°C (MA) unless the application temperature of the mastic asphalt declared by the manufacturer is <220°C (LMA_{min}) in which case the application temperature of the mastic asphalt shall be at the temperature LMA_{min} declared by the kit manufacturer.

The test shall be carried out at conditions (T5)

The general modes of failure are to be described following EN ISO 4624: 2003, see 5.1.1.1 above.

5.1.4.2 Resistance to shear (assembled system to overlay)

This test is required for use category (A) using specimen types 5a.

The maximum shear strength between the waterproofing layer and the overlay shall be determined in accordance with EN 13653: 2004. The test shall be performed on a specimen prepared in accordance with Annex B under application conditions (P1).

The application temperature of the low temperature mastic asphalt overlay (LMA) shall be at $<220^{\circ}\text{C}$ (LMA_{min}). The test shall be carried out at conditions (T5).

For mastic asphalt (MA) and coarse bituminous mixture (CBM) overlays this test is covered by the shear to support test (5.1.1.7).

5.1.4.3 Slipperiness

This test is required for use categories (B) or (C) and carried out on specimen type 1 in accordance with Annex B under application conditions (P1).

The coefficient of friction of the exposed waterproofing layer shall be determined in accordance with EN 13036-4: 2003, using the 4S slider rubber.

5.1.5 Protection against noise

Not relevant

5.1.6 Energy economy and heat retention

Not Relevant

5.1.7 Aspects of durability, serviceability and identification

5.1.7.1 Aspect of durability

5.1.7.1.1 General

The aspects related to the durability of liquid applied bridge deck waterproofing, and which shall be taken into account, are:

- Materials in contact:
 - Water
 - Alkali
 - Oil, petrol, diesel and de-icing salts
 - Bitumen (only on materials that are used with an asphalt overlay)
- Climatic conditions including:
 - Heat ageing
 - Freeze/thaw
- UV radiation (if the kit is exposed)
- Abrasion/wear (if the kit is exposed and trafficked)

5.1.7.1.2 Materials in contact

5.1.7.1.2.1 Water (Wa)

The water absorption by mass of a free film of the waterproofing layer (specimen type 2) shall be determined in accordance with EN 14223: 2005. The test shall be repeated with the exception that the cut edges of the specimen are sealed.

The variation in mass is verified in accordance with EN 14223: 2005.

The micro hardness according to ISO 48: 2007 (method M) shall be determined on specimens before and specimens after the water absorption test.

5.1.7.1.2.2 Alkali (Al)

Three specimens 50 x 50 mm² are to be tested. The test is carried out on specimen type 2 in accordance with Annex B under application conditions (P1), following EN ISO 175: 2001, (storage in 1% (w/w) aqueous solution of sodium hydroxide) at (50±2) °C for (28 ± 0.5)days. The samples are dried at (50 ± 2) °C until constant mass is achieved.

The micro hardness according to ISO 48: 2007 (method M) and the mass according to EN ISO 175: 2001 shall be determined on specimens exposed to alkali after drying and on specimens not exposed to the alkali solution.

5.1.7.1.2.3 Oil, petrol, diesel, de-icing salts

This shall be assessed by the Approval Body with reference to published chemical resistance data for the chemical family given by the manufacturer for his product.

5.1.7.1.2.4 Bitumen (Bi)

This test is required for use categories (A) and carried out on specimen type 2 in accordance with Annex B under application conditions (P1).

Two specimens approximately 120 x 60 mm² are stored in bitumen 50/70 penetration for (84 ± 0.5) days in a ventilated oven at a temperature of (70 ± 2) °C. A beaker with a content of 250 cm³ is filled with bitumen that covers the samples by approximately two-thirds. After storing the bitumen is carefully removed with a spatula.

The micro hardness shall be determined according to ISO 48: 2007 (Method M) on specimens before and on specimens after exposure to bitumen.

5.1.7.1.3 Durability due to climatic conditions (high and low temperatures)

The assembled system shall be tested to determine the effects of:

- Heat ageing
- freeze/thaw

5.1.7.1.3.1 Heat ageing (HA)

a) This test is required for use categories (A) and carried out on specimens of types depending on the test to be carried out after ageing. The test specimens are prepared in accordance with Annex B under application conditions (P1).

High temperatures cause change of product characteristics (ageing). The heat ageing is carried out according to EOTA TR 011: 2004 at a temperature of (70 ± 2)°C for (28 ± 0.5) days on specimens of types depending on the test to be carried out after ageing.

Following heat ageing the following tests shall be carried out:

- capacity to bridge cracks as described in 5.1.1.2.
- tensile properties (tensile stress and tensile elongation at tensile strength) in accordance with EN ISO 527-2: 1996 (specimen type 1B) before and after heat ageing (x-head speed 1 mm min⁻¹ at -10° C and 10 mm min⁻¹ at 23° C.)

Additionally, if required⁽¹⁾, bond strength to the support, as described in 5.1.1.1, after heat ageing may be determined.

Note 1: *Required to satisfy the requirements of one or more member state.*

b) In the case of use categories (B) and (C) the heat ageing is covered by the conditions of exposure to UV radiation carried out in accordance with 5.1.7.1.4.

5.1.7.1.3.2 Freeze Thaw (FT)

a) This test is required for all use categories on specimen type 1 prepared in accordance with Annex B under application conditions (P1),

The specimens shall be subjected to 20 cycles in accordance with EN 13687-3: 2002, except that the bond strength to support test defined in the standard is replaced by the test described in 5.1.1.1.

b) If required⁽¹⁾, for use category (A)

Specimen types 3 or 4 or 5a/b prepared in accordance with Annex B under application conditions (P1), shall be subjected to 20 cycles in accordance with EN 13687-3: 2002, excluding the bond test.

Any or all of the following tests may also be carried out after the freeze thaw cycling:

- resistance to shear to support (5.1.1.7)
- resistance to shear to overlay (5.1.4.2).
- bond strength to overlay (5.1.4.1)

Note 1: *One or more of these tests may be required to satisfy the requirements of one or more member state.*

5.1.7.1.4 UV radiation (UV)

This test is required for use categories (B) and (C) the specimen used will depend on the test carried out following UV radiation. The specimen shall be prepared in accordance with Annex B under application conditions (P1).

Specimens, including any UV protection layer if required by the manufacturer, shall be exposed in accordance with EOTA TR 010: 2004 for a total of 5000 hours (condition 'S') to UV radiation using fluorescent tubes (UV-A).

The following tests shall be carried out:

- tensile properties (tensile stress and tensile elongation at tensile strength) in accordance with EN ISO 527-2: 1996 (specimen type 1B) before and after UV exposure (x-head speed 1 mm min⁻¹ at -10°C and 10 mm min⁻¹ at 23°C).
- capacity to bridge cracks in accordance with clause 5.1.1.2.
- water tightness (see 5.1.1.8),

5.1.7.1.5 Abrasion / Wear

This test is required for use category (B) using type 1 test specimens in accordance with Annex B under application conditions (P1).

The resistance to wear shall be determined in accordance with DD ENV 12633: 2003 except that the pendulum test before (see 5.1.4.3) and after wear shall be carried out in accordance with the method defined under 5.1.4.3.

5.1.7.2 Aspects of serviceability

The following characteristics of liquid applied bridge deck waterproofing kits are necessary to allow judgement of an assembled system's ability to satisfy the CPD but which are not covered by 5.1.1 to 5.1.6.

- High and low service temperatures
- Capacity to penetrate pores in the support
- Resistance to flow (application to non-horizontal surfaces)
- Applied thickness
- The effects of climatic conditions on application
- The effects of the quality of the support

5.1.7.2.1 High and low service temperatures

The assembled system has to maintain its function over the expected in-service temperature range.

The effects of low temperature are covered by the capacity to bridge cracks (5.1.1.2).

If required¹, additional effects of high and low service temperature may be established by measuring the characteristics bond strength to the support (5.1.1.1) at +40°C, -10°C or -20°C, and resistance to shear to support (5.1.1.7) at +40°C and/or -10°C.

The test temperatures are chosen by the manufacturer to satisfy the requirements of the Member States where the kit will be marketed.

Note1: *One or more of these tests may be required to satisfy the requirements of one or more member state*

5.1.7.2.2 Capacity to penetrate pores in the support

This aspect is covered by the bond strength to support (5.1.1.1).

If required⁽¹⁾, the capacity of a priming coat only to penetrate pores is determined by measuring viscosity in accordance with EN ISO 3219: 1995 at T5, and at the lowest application temperature declared by the manufacturer.

Note1: *May be required to satisfy the requirements of one or more member state*

5.1.7.2.3 Resistance to flow (associated with the application to non-horizontal surfaces)

The manufacturer shall demonstrate that the kit can be applied to a vertical surface without slumping or sagging and has the necessary rheological properties to maintain the required nominal thickness.

If necessary, the ability to apply the components of the kit satisfactorily on non-horizontal surfaces shall be determined using the test described in Annex E. If, to satisfy this test a product is modified e.g. by addition of a thixotrope, tensile strength and elongation, tests shall be carried out to compare against the unmodified product and assess the possible consequences on the performance of the assembled system.

The surface roughness of the vertical part of the concrete support shall be prepared in accordance with Annex B.

5.1.7.2.4 Applied thickness

The manufacturer shall declare the applied mass per unit area of the liquid waterproofing layer required to give a 1.0 mm dry film thickness on a smooth surface, the nominal thickness and the thickness range. The thickness shall be verified during sample preparation, see Annex B.

5.1.7.2.5 The effects of climatic conditions on application (SC)

The manufacturer shall declare values for curing rates over the range of application conditions.

The effect of severe climate application conditions on curing rates and on the performance of the assembled system shall be verified by the bond strength carried out in accordance with clause 5.1.1.1 using specimens prepared at the extremes of range of climatic conditions declared by the manufacturer, i.e. minimum and/or maximum temperature $\pm 2^{\circ}\text{C}$ in combination with maximum relative humidity $\pm 5\%$ allowed by the manufacturers installation instructions for his product.

5.1.7.2.6 The effects of the quality of the support

5.1.7.2.6.1 Moisture content (MC)

The ability of a kit to be applied to concrete with high moisture content or young concrete shall be established by preparation and conditioning in accordance with EN 13578 with the exception that the concrete support shall be in accordance with Annex B of this ETAG.

The bond strength to the support shall be tested at T5 in accordance with 5.1.1.1.

5.1.7.2.6.2 Day joints (OA)

This test is carried out to determine whether an adequate bond can be achieved between two layers of the waterproofing membrane applied one over the other within a short period of time to simulate day joints.

The bond strength shall be determined in accordance with clause 5.1.1.1 except that the test specimen shall include a second waterproofing layer applied between 24 hours and 48 hours of the application of the first layer and include any pre-treatment required by the manufacturer.

5.1.7.2.6.3 Section joints (up to six months) (OA)

This test is carried out to determine whether acceptable adhesion can be achieved between two layers of the waterproofing membrane applied one over the other between 7 days and six months of the application of the first layer. The test simulates section joints that may occur between waterproofing different sections of a bridge or where patch repairs may be required..

Specimens are prepared on a rigid steel plate ⁽¹⁾ (10mm thick) at P1/P1 conditions (see 5.1.7.2.4) and allowed to cure for 7 days at 23 °C. After that the specimen shall be exposed to UV radiation, elevated temperature and water according to EN 1297 for 7 days.

After the exposure a second waterproofing layer shall be applied according to the instructions of the manufacturer.

Following the curing time specified by the manufacturer, the bond strength between the two layers of waterproofing shall be determined in accordance with 5.1.1.1.

Note1: Steel plate is used as the substrate to facilitate the placing of specimens in the QUV weatherometer.

5.2 Components

5.2.1 Requirements for components

There are no specific requirements for components. The manufacturer in consultation with the Approval Body shall agree the tests required to adequately characterise the components of the kit.

Tests must be chosen to allow the verification of the composition of the component(s) at any time.

Tables 1 to 4 below give examples of the tests that are available and that may be used for this purpose.

The list is not definitive and where no appropriate EN or ISO standard is available, the use of a national standard is permitted.

5.2.2 Aspects of Identification

The identification parameters shall be chosen appropriately, so that they give a clear understanding of the properties of the component.

The specifications of materials and components, as far as possible, shall provide maximum flexibility to choose alternative components, without affecting the declared performances or the fitness for the intended use. This has to be ensured by the manufacturer performing the Type Testing for a component on the basis of the ETA. Therefore the Approval Body shall define the Type Testing by selecting tests of characteristics which correlate to the assessed performance of the assembled system. Hence the specifications, as far as possible, should refer to a harmonised European product standard or ETA.

If this is not possible, the materials shall be specified by their brand name and type, class, etc., identifying the manufacturer.

EXAMPLES OF CHARACTERISATION TESTS

TABLE 3 - Identification of the waterproofing layer component(s)

Identification characteristic	Test method	Tolerances ¹⁾
Liquid products		
General appearance, including colour	Visual	Uniform and similar to the description provided
Infrared analysis	EN 1767 (1999) ⁽²⁾	The position and relative intensities of the main absorption bands shall match those of the reference spectrum
Density	EN ISO 2811-1 to-4 (2001)	± 3 %
Non volatile matter	EN ISO 3251(2003) ⁽³⁾	± 5 %
Ash content	EN ISO 3451-1(1997) ⁽⁴⁾	± 1 (absolute value)
Viscosity	EN ISO 3219 (1995)	± 20 %
Functional group content		
Epoxies		
epoxy equivalent	EN 1877-1	± 5 %
amine functions	EN 1877-2	± 6 %
Polyurethanes		
hydroxyl value	EN 1240	± 10 %
isocyanate content	EN 1242	± 10 %
Polyureas		
amine functions	EN 1877-2	± 6 %
isocyanate content	EN 1242	± 10 %
Acrylics ⁵⁾		
methacrylate content	DIN 16945 chap. 4.17 Following the principle of EN ISO 3251 (mass loss)	± 5 %
acid value	EN ISO 2114 (2000)	± 10 %
Polyesters ⁵⁾		
saponification value	EN ISO 3681 (1998)	± 5 %
acid value	EN ISO 2114, (2002)	± 10 %
styrene content ⁽³⁾	Following the principle of EN ISO 3251 (weight loss)	± 5 %
hydroxyl value	EN ISO 2554,	± 5 %
Fresh/mixture		
Pot life ⁶⁾	EN ISO 9514	± 15 %
Progress in hardness after 7 days	Following the principles of EN ISO 868	± 5 (absolute value)
Hardened mixture		
Tensile stress and elongation at tensile strength ⁷⁾ (7 days)	EN ISO 527-2: 1996	± 20 %
Notes:		
1) <i>Suggested acceptable deviation from the manufacturer's declared value (examples only)</i>		
2) <i>Procedure 7.1, (Measurement of products without solvent or filler), is applicable. If the products contain mineral filler, the filler is eliminated by centrifuging, but without adding organic solvent.</i>		
3) <i>Test conditions: sample quantity (1 ± 0,1) g, temperature (125 ± 2) °C, duration -60 minutes.</i>		
4) <i>Test to be performed if the product contains filler. Test conditions: ash temperature (600 ± 25) °C.</i>		
5) <i>Catalysts, inhibitors and accelerators are usually bought as chemical pure products and are not taken over in the identification plan.</i>		
6) <i>Pot life: period of time taken by the freshly mixed product to increase in temperature by 15 °C (o r the maximum temperature increase if less than 15 °C).</i>		
<i>For acrylics and polyesters, pot life shall be determined with the addition of a given amount of catalyst.</i>		
7) <i>Tested: without reinforcement.</i>		
<i>Test sample: type 1, at the nominal thickness of one layer.</i>		

TABLE 4 - Identification of priming coat, finish layer and tack coat component(s)

Identification characteristic	Test method	Tolerances ¹⁾
General appearance and colour	Visual	Uniform and similar to the description provided
Infrared analysis ²⁾	EN 1767	The position and relative intensities of the main absorption bands shall match those of the reference spectrum
Density	ISO 2811	± 3 %
Non volatile matter ³⁾	EN ISO 3251	± 5 %
Viscosity	EN ISO 3219	± 20 %
Surface dry – glass beads method	EN ISO 1517	± 10 %
Notes:		
1) <i>Suggested deviation from the manufacturer's documented value.</i>		
2) <i>Where reactive systems are used, procedure 7.1 (Measurement of products without solvent or filler) is applicable. If the products contain mineral filler, the filler is eliminated by centrifuging, but without adding organic solvent.</i>		
3) <i>Test conditions: sample -(1 ± 0,1) g temperature -(105 ± 2) °C duration -60 minutes Where reactive systems are used, test temperature shall be : (125 ± 2) °C.</i>		

TABLE 5 - Identification of mineral component(s)

Identification characteristic	Test method	Tolerances ¹⁾
Particle size distribution	EN 933-1 and EN 933-2	> 2 mm : ± 6% 2 mm – 0,063 mm : ± 4% < 0,063 : ± 2% (absolute value) all sieves > 0,1 mm: ± 5% (absolute value)
Nature	Declaration	
Moisture content		< declared value
Note: 1) Suggested deviation from the manufacturer's documented value.		

TABLE 6 - Identification of internal layer component(s)

Identification characteristic	Test method	Tolerances ¹⁾
Nature	Declaration	
Mass per unit area	EN 29073-1 or ISO 4605	± 2 %
Tensile characteristics	EN 29073-3 or ISO 3342	± 20 %
Note 1) Suggested deviation from the manufacturer's documented value.		

6. ASSESSING AND JUDGING THE FITNESS OF PRODUCTS FOR AN INTENDED USE

This chapter details the performance requirements⁽¹⁾ to be met (chapter 4) in precise and measurable (as far as possible and proportional to the importance of the risk) or qualitative terms, related to the product and its intended use, using the outcome of the verification methods (chapter 5).

Note 1 Requirements may relate to minimum values for any of the Member States. Kits meeting minimum requirements may not be considered suitable for use in all or any member state.

6.0. Linking the Essential Requirements to kit requirements.

Table 7 - Table linking Essential Requirements to performance requirements of the kit

E R	Characteristics specified in the mandate	ETAG paragraph on kit performance to be assessed	Class, criterion	No performance determined option in relation with use category	
1	+ Bond strength to support	6.1.1.1	≥ LV, report result	(A), (B) and (C)	No
	+ Capacity to bridge cracks	6.1.1.2	Pass at declared test temperature given in the test method	(A), (B) and (C)	No
	+ Resistance to chloride ion penetration	6.1.1.3	< LV, pass/fail	(A), (B) and (C)	Yes
	+ Resistance to dynamic actions				
	- Resistance to compaction	6.1.1.4.1	Pass/fail	A.1 A.2, A.3, A4(B) and (C)	No Not relevant
	- Fatigue and cracking	6.1.1.4.2	Covered by capacity to bridge cracks, see 6.1.1.2		
	- Impact resistance	6.1.1.4.3	Covered by resistance to compaction, see 6.1.1.4.1		
	+ Resistance to heat impact	6.1.1.5		(A), (B) and (C)	No Not relevant
	- Indirect method		Bond strength to support (See 6.1.1.1) Crack bridging ability (see 6.1.1.2) Change in tensile characteristics on specimen type 2. Report results		
	- Direct method		Shear strength to support and to overlay See 6.1.1.7 Bond strength to overlay See 6.1.4.1 Crack bridging ability with mastic asphalt overlay See 6.1.1.2		
	Resistance to perforation	6.1.1.6	Report Results	(A), (B) and (C)	No
	+ Resistance to shear to support	6.1.1.7	Report results	(A) (B) and (C)	No Not relevant
	+ Water-tightness	6.1.1.8	Pass	(A), (B) and (C)	No
3	Release of dangerous substances	6.1.3.1	Declaration of the manufacturer	(A), (B) and (C)	No
4	+ Bond strength to overlay	6.1.4.1	Report results	(A) (B) and (C)	No Not relevant
	+ Resistance to shear to overlay			6.1.4.2	Report results

+ Slipperiness	6.1.4.3	Report results	(A)	Not relevant
			(B) and (C)	No
Aspects of durability				
Compatibility of materials in contact with:				
Water	6.1.7.1.2.1	Change in mass: LV and report result Micro hardness: report result	(A), (B) and (C)	No
Alkali	6.1.7.1.2.2	Change in mass: LV Micro hardness: Report result	(A), (B) and (C)	No
Oil, petrol, diesel, de-icing salts	6.1.7.1.2.3	Manufacturer declaration	(A), (B) and (C)	No
Bitumen	6.1.7.1.2.4	Micro hardness: Report result	A1,A2 and A3	No
			A4, (B) and (C)	Not relevant
Durability due to climatic conditions (high and low temperatures)				
Heat ageing	6.1.7.1.3.1	Capacity to bridge cracks (see 6.1.1.2) Change in tensile characteristics: Report relative changes	(A)	No
		- Bond strength to support (report result) (See 6.1.1.1)	(A)	Yes
		For use categories (B) and (C) covered by UV radiation, see 6.1.7.1.4	(B) and (C)	No
Freeze Thaw	6.1.7.1.3.2	Bond strength: see 6.1.1.1	(A), (B) and (C)	No
		Resistance to shear to support and resistance to shear to overlay: see 6.1.1.7 Bond strength to overlay: see 6.1.4.1	(A)	Yes
UV radiation	6.1.7.1.4	Report relative changes in tensile characteristics: Capacity to bridge cracks, see 6.1.1.2 Water-tightness, see 6.1.1.8	(A)	Not relevant
			(B) and (C)	No
Abrasion / Wear	6.1.7.1.5	Report result	(A)	Not relevant
			(B) and (C)	No
Aspect of serviceability				
High and low service temperatures	6.1.7.2.1	Capacity to bridge cracks, see 6.1.1.2		No
		Bond strength to support , see 6.1.1.1 Resistance to shear to support, see 6.1.1.1		yes
Capacity to penetrate pores in the support	6.1.7.2.2	Bond strength See 6.1.1.1		No
		For priming coat viscosity (Report result)		No
Resistance to flow	6.1.7.2.3	Pass/fail		Yes
Applied thickness	6.1.7.2.4	Report verified range		No
The effects of climatic conditions on application	6.1.7.2.5	See 6.1.1.1		No
The effects of the quality of the support				
- Moisture content	6.1.7.2.6.1	Report result		No
- Day joints	6.1.7.2.6.2	Report result		No
-Section joint	6.1.7.2.6.3	Report result		No

Note: A, B and C refer to use categories as defined in clause 2.2.2

LV = Limiting value

6.1 Assembled Systems

6.1.1 Mechanical resistance and stability

6.1.1.1 Bond strength (assembled system to support)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.1 by means of passing the verification procedure as described in 5.1.1.1.

The bond strength between the waterproofing layer and the concrete support shall be a minimum value of 1.0 MPa.

The results of the tests shall be reported in the ETA.

6.1.1.2 Capacity to bridge cracks

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.2 by means of passing the verification procedure as described in 5.1.1.2.

The test is passed if at least 2 of 3 specimens tested fulfil the requirement at the chosen temperature according 5.1.1.2.

The specimen type and any pre-conditioning shall be recorded in the ETA.

6.1.1.3 Resistance to chloride ion penetration

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.3 by means of passing the verification procedure as described in 5.1.1.3.

The increase in chloride ion concentration in the concrete shall be less than 0,04%.

6.1.1.4 Resistance to dynamic actions

6.1.1.4.1 - Resistance to compaction of a coarse bituminous mixture

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.4 by means of passing the verification procedure as described in 5.1.1.4.1.

The resistance to compaction of a coarse bituminous mixture on the waterproofing layer shall give a pass result.

6.1.1.4.2 Fatigue and cracking

See 6.1.1.2

6.1.1.4.3 Impact resistance

See 6.1.1.4.1

6.1.1.5 Resistance to heat impact

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.5 by means of passing the verification procedure as described in 5.1.1.5.

For direct method:

- Shear strength to support and to overlay, see 6.1.1.7.
- Bond strength to overlay, see 6.1.4.1.
- Crack bridging (in the case of specimen types 4 or 5), see 6.1.1.2

For indirect test method:

- Bond strength to support, see 6.1.1.1
- Crack bridging ability, see 6.1.1.2
- Tensile characteristics. The relative change in tensile characteristics shall be reported.

6.1.1.6 Resistance to perforation

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.6 by means of passing the verification procedure as described in 5.1.1.6.

Note: Further information on resistance to perforation may be obtained from the resistance to chloride ion test (see 6.1.1.3) and resistance to compaction, see 6.1.1.4.1.

6.1.1.7 Resistance to shear (assembled system to support)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.7 by means of passing the verification procedure as described in 5.1.1.7.

This requirement applies to non-exposed assembled systems with an overlay only.

The shear stress/strain curve shall be reported in the ETA.

6.1.1.8 Water-tightness

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.1.8 by means of passing the verification procedure as described in 5.1.1.8.

The water-tightness of a free film of the waterproofing layer shall give a pass result.

6.1.2. Safety in case of fire

Not Relevant

6.1.3 Hygiene, Health and the Environment

6.1.3.1 Release of dangerous substances

The product/kit shall comply with all relevant European and national provisions applicable for the uses for which it is brought to the market. The attention of the applicant should be drawn on the fact that for other uses or other Member States of destination there may be other requirements which would have to be respected. For dangerous substances contained in the product but not covered by the ETA, the NPD option (no performance determined) is applicable.

6.1.4 Safety in use

6.1.4.1. Bond strength (assembled system to overlay)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.4.1 by means of passing the verification procedure as described in 5.1.4.1.

This requirement applies to non-exposed systems with an overlay only.

- The bond strength between the waterproofing layer and the overlay shall be reported in the ETA.

6.1.4.2 Resistance to shear (assembled system to overlay)

See 6.1.1.7 and refer to 4.1.4.2 for requirements and 5.1.4.2 for testing.

6.1.4.3 Slipperiness

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.4.3 by means of passing the verification procedure as described in 5.1.4.3.

This requirement applies only to exposed kits without an overlay.

- The friction coefficient shall be reported in the ETA.

6.1.5 Protection against noise

Not relevant

6.1.6 Energy economy and heat retention

Not Relevant

6.1.7 Aspects of durability, serviceability and identification

6.1.7.1 Aspect of durability

6.1.7.1.2 Compatibility with materials in contact

6.1.7.1.2.1 Water:

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1. by means of passing the verification procedure as described in 5.1.7.1.2.1.

- The water absorption of a free film with sealed edges shall not exceed 2.5 % by mass.
- The water absorption of a free film without sealed edges shall be reported.
- The change in micro hardness of a free film shall be reported.

6.1.7.1.2.2 Alkali

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1 by means of passing the verification procedure as described in 5.1.7.1.2.2.

- the change in mass shall be $\leq 0.5\%$ (LV)
- the change in micro hardness of a free film shall be reported..

6.1.7.1.2.3 Oil, petrol, diesel, de-icing salts...

The manufacturer shall declare and provide evidence to show that the waterproofing system will retain its functionality following exposure to defined chemicals and/or biological agents. In the event that satisfactory evidence is not available to satisfy the Approval Body then additional testing will be required.

6.1.7.1.2.4 Bitumen

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1 by means of passing the verification procedure as described in 5.1.7.1.2.4.

The change in micro hardness shall be reported.

6.1.7.1.3 Durability due to climatic conditions (high and low temperatures)

6.1.7.1.3.1 Heat ageing

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1 by means of passing the verification procedure as described in 5.1.7.1.3.1.

After heat ageing:

- crack bridging test, see 6.1.1.2, shall be carried out
- relative change in tensile characteristics shall be reported.

If required, bond strength between the waterproofing layer and the concrete support see 6.1.1.1 shall be assessed.

Note: For exposed systems the heat ageing is covered by the conditions of exposure to UV radiation, see 6.1.7.1.4.

6.1.7.1.3.2 Freeze Thaw

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1. by means of passing the verification procedure as described in 5.1.7.1.3.2.

After Freeze Thaw, for bond strength: see clause 6.1.1.1.

After Freeze Thaw, if required:

- resistance to shear between the assembled system and support, see 6.1.1.7
- resistance to shear between the assembled system and overlay, see 6.1.4.2
- bond strength between the assembled system and overlay, see 6.1.4.1

6.1.7.1.4 UV radiation (exposed kits only)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1. by means of passing the verification procedure as described in 5.1.7.1.4.

The relative change in tensile characteristics shall be reported.

If required, after exposure to UV radiation:

- capacity to bridge cracks, see 6.1.1.2
- water-tightness, see 6.1.1.8.

6.1.7.1.5 Abrasion / Wear (exposed and trafficked kits only)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.1 by means of passing the verification procedure as described in 5.1.7.1.5.

The wear of the waterproofing layer after the test shall be reported.

6.1.7.2 Aspects of serviceability

The following characteristics of liquid applied bridge deck waterproofing kits are necessary to allow judgment of an assembled system's ability to satisfy the CPD but which are not covered by 5.1 to 5.6.

6.1.7.2.1 High and low service temperatures

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.1.

The capacity to bridge cracks: see 6.1.1.2 shall be assessed and reported in the ETA.

If required:

- bond strength between the assembled system and support at +40°C, -10°C or -20°C shall be reported.
- resistance to shear between the assembled system and support at +40°C and -10°C shall be reported.

6.1.7.2.2 Capacity to penetrate pores in the support

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.2.

Bond strength between the assembled system and support, see 6.1.1.1 shall be assessed and reported in the ETA.

The viscosity of the priming coat under sample preparation conditions shall be reported.

6.1.7.2.3 Resistance to flow (associated with the application to non-horizontal surfaces)

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.3.

If required, where testing in accordance with the test method described in Annex E is carried out the loss in mass shall not exceed 10% and there shall be no discernible changes e.g. slump, flow, loss of adhesion or reduction in thickness.

6.1.7.2.4 Applied thickness

The verified thickness range declared by the manufacturer shall be recorded in the ETA.

6.1.7.2.5 The effects of climatic conditions on application

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.5.

The bond strength between the waterproofing layer and the concrete support shall be a minimum value of 1.0 MPa. The result of the test shall be reported in the ETA.

6.1.7.2.6 The effects of the quality of the support

6.1.7.2.6.1 Moisture content

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.6.1

The bond strength between the waterproofing layer and the concrete support shall be reported in the ETA.

6.1.7.2.6.2 Day joints

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.6.2

The bond strength and mode of failure shall be reported in the ETA.

6.1.7.2.6.3 Section joints

The product will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.7.2 by means of passing the verification procedure as described in 5.1.7.2.6.3

The bond strength and mode of failure shall be reported in the ETA.

6.2 Components

There are no specific requirements for components to be assessed.

The product/kit shall comply with all relevant European and national provisions applicable for the uses for which it is brought to the market. The attention of the applicant should be drawn on the fact that for other uses or other Member States of destination there may be other requirements which would have to be respected. For dangerous substances contained in the product but not covered by the ETA, the NPD option (no performance determined) is applicable

7. ASSUMPTIONS AND RECOMMENDATIONS UNDER WHICH THE FITNESS FOR USE OF THE PRODUCTS IS ASSESSED

This chapter sets out the assumptions and recommendations for design, installation and execution, packaging, transport and storage, use, maintenance and repair under which the assessment of the fitness for use according to the ETAG can be made (only when necessary and in so far as they have a bearing on the assessment or on the products).

The works in which a liquid applied bridge deck waterproofing kit is installed, is deemed to satisfy the 'Essential Requirements' when that kit is assessed and declared "fit for use" (see 6.0) and when the application methods and design rules, specified by the Applicant, are fulfilled.

Since the application method of kit(s) is the spraying, spreading or brushing of liquid components, whether or not blended in advance, the "incorporation in the works" is in fact the manufacturing of the bridge deck waterproofing as an "assembled system". The proper incorporation, assembly, application and installation therefore shall be possible under practical circumstances.

It is assumed that:

7.1 Design of works

The design of the works includes the use of suitable materials and be designed so that the waterproofing layer can be applied in a practicable and economic manner and in accordance with the manufacturer's instructions.

Assumptions relating to the condition of the support are also made (see section 2.3.3).

7.2 Packaging, transport and storage

The manufacturer's advice and the necessary information for the transportation and storage, including maximum and minimum storage temperatures are observed.

Where kits incorporate chemicals, flammable components or other potentially hazardous materials the instructions includes specific guidance on restrictions and/or conditions for handling, transport and storage of these components.

7.3 Execution of works (installation, assembling, incorporation, etc., including, if necessary, test methods for verifications on site)

The application methods and design rules for the kit is included in the Manufacturer's Technical Dossier and is confirmed by the Approval Body. As a minimum, this should address the following:

7.3.1 Influence of weather conditions

Recommendations on measures to be taken in order to accommodate the effects of the weather, such as excessive moisture, wind and temperature are observed.

7.3.2 Application of components

The manufacturer's installation instructions shall contain information on at least the following:

- List of acceptable substrate repair materials;
- Definition of an acceptable surface;
- Preparation of the substrate (cleanness, moisture content, flatness, texture, treatment of cracks etc.);
- Definition and application rate of primer and tackcoat if applicable;
- Method of application, overlaps (including day joints), order of application and finish layers, maximum slope;

- Field of use of internal layer (on the whole surface, or joints...) and its incorporation in the assembled system;
- Required minimum and allowable maximum thickness of the various layers necessary to achieve the assessed thickness;
- Period of time between the applications of each component, taking account of weather conditions;
- Total curing time and trafficking time of the whole assembled system i.e. before the application of the overlay;
- Types of overlay, if applicable;
- Minimum and maximum overlay temperatures (for mastic asphalt and coarse bituminous mixture), if applicable;
- Recommendations for on-site quality assurance.

Where kits are applied by mixing components while spraying, the installation instructions shall contain specific guidance on process control on site (during applications) e.g.:

- Adjustment of machinery and devices used for mixing of components;
- Adjustment of mixing ratio or additives related to temperature, moisture;
- Adjustment of pressure related to height of the works, viscosity of components etc.

The installation instructions shall (where appropriate) contain precise information on particular measures with regard to the application of the kit at various details e.g. up-stands, drains, penetrations and elevations.

7.3.3 Safety measures

Where the kits incorporate flammable or hazardous components, the installation instructions shall give precise information to allow the safe use and application.

Where kits can be spray-applied, the installation instructions shall contain guidance on protective measure regarding personnel and the direct environment.

Information shall be provided on the protective measures to be taken to ensure that worker safety is not compromised by low slip resistance during installation or maintenance operations.

7.3.4 Product waste

Where the kits involve the use of chemicals and potentially hazardous materials, the installation instructions should give information to enable the safe disposal of waste in accordance with the relevant national regulations.

7.4 Maintenance and repair

Guidelines for maintenance and repair, including specific measures related to maintenance of protective finish layers (in the case of exposed systems), if any, are included in the Manufacturer's Technical Dossier.

Section three:

ATTESTATION AND EVALUATION OF CONFORMITY

8. EVALUATION AND ATTESTATION OF CONFORMITY AND CE MARKING

8.1 System of conformity attestation

According to the decision **2003/722/EC** dated 6/10/2003 of the European Commission ⁽¹⁾, the system of conformity attestation given in Table A applies.

Note (1) Official Journal of the European Union L260/32 dated 11/10/2003

Table A - System of attestation of conformity applicable to liquid applied bridge deck waterproofing kits (and components of kits)

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Liquid applied bridge deck waterproofing kits	Exclusively in bridge decks	-	2+

The attestation of conformity system of 2+ (First Possibility) referred to in Table A is defined in the Directive 89/106/EEC (CPD), Annex III (2) (ii) as follows:

Declaration of conformity of the product by the manufacturer on the basis of:

(a) *Tasks for the manufacturer:*

- (1) *initial type-testing of the product*
- (2) *factory production control*
- (3) *testing of samples taken at the factory in accordance with a prescribed test plan.*

(b) *Tasks for the notified body:*

- (4) *certification of factory production control on the basis of:*
 - *initial inspection of factory and of factory production control;*
 - *continuous surveillance, assessment and approval of factory production control.*

8.2 Tasks and responsibilities of manufacturer and notified bodies

In transposing the relevant systems of attestation of conformity to the approved product the Approval Body has to lay down the specific tasks of the manufacturer and the notified body (if relevant) in the process of attestation of conformity in Control Plans.

Both large and small companies produce these products and there is a wide variation in the materials and test methods used. Therefore a precise test plan can only be set up on a case-by-case basis.

In general it is not necessary to conduct tests on complete kits or applied systems. Indirect methods will normally be sufficient, e.g. control of raw materials, manufacturing processes and properties of components.

The following gives general cornerstones on how to write these Control Plans for the products covered under this ETAG. They must be specified and filled in by the Approval Body for the approved product under consideration of the specified production process of the manufacturer.

It is assumed that the characteristics given in the following Control Plans have a correlation to the function of the kits.

8.2.1 Tasks for the manufacturer

Table B – Control Plan for the manufacturer of LABDWK

Table B is an example of a possible Control Plan. The actual Control Plan for the subject of an ETA shall be agreed between the Approval Body and the manufacturer.

Type of control		Test or control method ⁽¹⁾	Minimum extent/frequency of control	
AoC element (acc. to CPD Annex III.1) (for 2+ AoC system)	Product, raw/constituent material, product component and characteristic concerned			
Factory production control (Including testing of samples in accordance with a prescribed test plan)	Identification of incoming materials	Depending on the nature of the materials	Every delivery	
	Assembled system or free film <i>Hardness</i> <i>Tensile characteristics</i> <i>Bond strength to support</i>	ISO 48 EN ISO 527 5.1.1.1	Once/ten batches (1/year min) Once/ten batches (1/year min) One /year	
	Membrane (liquid components): <i>Viscosity</i> <i>Density</i> <i>Pot life</i> <i>Curing time(progress of hardness)</i> <i>Volatile content</i> <i>Ash content</i> <i>Infrared Spectrometry</i> <i>Functional Group analysis- (NCO, OH, Epoxy, Amine etc)</i>	5.2 5.2 5.2 5.2 5.2 5.2 5.2 5.2	Every batch Every batch Every batch Every batch Every batch Once/year Once/ten batches (1/year min) Every batch	
	Primers / Tack coats / Finish layer: <i>Viscosity</i> <i>Density</i> <i>Volatile content</i> <i>ash content</i> <i>Infrared Spectrometry</i> <i>Surface dry time / pot life</i> <i>Functional Group analysis (NCO, OH, Epoxy, Amine etc)</i>	5.2 5.2 5.2 5.2 5.2 5.2 5.2	Every batch Every batch Every batch / once per year Once/ten batches (1/year min) Once/ten batches (1/year min) Every batch Every batch	
	Reinforcement / Internal layer: <i>Type / nature</i> <i>Tensile characteristics</i> <i>Weight / area</i>	5.2 5.2 5.2	Every delivery Every delivery Every delivery	
	Mineral Aggregate: <i>Type / nature</i> <i>Particle size distribution</i> <i>Moisture content</i>	5.2 5.2 5.2	Every delivery Every delivery Every delivery	
	Initial type test of the product..	No tests necessary when the tests leading to an ETA are done on components of the kit coming from the production process for kits covered by the ETA	-	-
		Identification of components Bond to substrate Bond to overlay Tensile characteristics before and after ageing	5.2 5.1.1.1 5.1.4.1. 5.1.7.1.3.1	When starting the production process of the CE marked product or when starting a new production line.

(1) For incoming materials or finished components delivered by a supplier, the manufacturer of the kit is responsible and has to ensure that the tasks of the Control Plan for the manufacturer shall be respected also by the supplier as far as he is concerned. If not then the manufacturer of the kit shall fulfill the tasks under the Control Plan.

8.2.1.1 Initial Type Testing (ITT)

Approval tests will have been conducted by the Approval Body or under its responsibility (which may include a proportion conducted by a laboratory or by the manufacturer, witnessed by the Approval Body) in accordance with Chapter 5 of this ETAG. The Approval Body will have assessed the results of these tests in accordance with Chapter 6 of this ETAG, as part of the ETA issuing procedure.

These tests may be used for the purposes of Initial Type Testing if they are done on samples coming from the current production process of the manufacturer which is referred to in the ETA. So further tests are not necessary. In this respect Approval Bodies shall be able to have appropriate arrangements with relevant Notified Bodies to avoid duplication, whilst respecting each other's responsibilities.

If the approval tests are done on samples e.g. of a prototype or if a new production line is started at the beginning of a new production process additional ITT is necessary.

8.2.1.2 Factory production control (FPC)

The manufacturer shall exercise permanent internal control of production including the production process and testing of materials before, during and at the end of that process. All the elements, requirements and provisions adopted by the manufacturer, including defined values and tolerances for the characteristics given in the Control Plan, shall be documented in a systematic manner in the form of written policies and procedures in the Manufacturers Technical Dossier (MTD). This production control system shall ensure that the product remains in conformity with the European Technical Approval (ETA).

Manufacturers having a Quality Management system which complies with EN ISO 9001 and an FPC system which addresses the requirements of this ETAG are recognised as satisfying the FPC requirements of the Directive.

8.2.1.3 Testing of samples taken at the factory in accordance with a prescribed test plan

This task refers to the testing of finished product coming out of the production process. When the requirements of the FPC and the Control Plan are fulfilled, it is not necessary to have additional tests carried out on samples taken at the factory.

8.2.1.4 Declaration of Conformity

When all the criteria of the Conformity Attestation on the basis of the tasks of the manufacturer and the tasks of the notified body (Certification of FPC) (see 8.2.2) are satisfied the manufacturer shall make a Declaration of Conformity and has to affix the CE mark to the kit.

8.2.2 Tasks for the Notified Bodies

Table C - Control Plan for the notified body for LABDWK

Type of control		Test or control method	Minimum extent/frequency of control
AoC element (acc. to CPD Annex III.1)	Product, raw/constituent material, product component and characteristic concerned		
Initial inspection of factory and of factory production control	Inspection of the factory and the factory production control of the manufacturer as described in the MTD and the Control Plan	Control of devices and equipment and the documentation of the FPC	When starting the production process or when starting a new production line
Continuous surveillance, assessment and approval of the factory production control	Surveillance, assessment and approval of the factory production control of the manufacturer as described in the MTD and the Control Plan	Control of the documentation of the FPC	Once a year

8.2.2.1 Assessment of the factory production control system - initial inspection and continuous surveillance

The assessment must be carried out of each production unit to demonstrate that the factory production control is satisfactory and in conformity with the MTD. This assessment shall be based on an initial inspection of the factory.

Subsequently continuous surveillance of factory production control is necessary to ensure continuing conformity with the ETA.

Surveillance inspections shall be conducted once a year but if necessary i.e. if the results of any inspection give rise to any remarks additional inspections may be required.

8.2.2.2 Certification of Factory Production Control

When the criteria of the assessment of the factory production control are fulfilled the notified body shall issue the Certification of the Factory Production Control.

8.3 CE Marking and accompanying information

According to Council Directive 93/68/EEC¹ the CE marking consists of the letters "CE", followed by the identification number of the notified certification body.

The ETA shall indicate the information to accompany the CE marking, i.e.

- The name and identifying mark of the producer and the manufacturing plant,
- The last two digits of the year in which the CE marking was affixed,
- The number of the EC Certificate of Conformity,
- The number of the European Technical Approval,
- Name of the product.

Example of CE-Marking and accompanying information:

 nnnn
Any Company Street 1 Country Plant 1 Yy nnnn-CPD-xxxx
ETA-YY/WWWW ETAG XXX

"CE"-symbol

Identification Number of the Notified Body

Name and address of the ETA-holder or his representative established in the EEA and of the plant where the kit was manufactured or the identifying mark of the producer.

Two last digits of year of affixing CE Marking

Number of EC certificate of Conformity

ETA Number

ETAG Number

Identification of components of the kit

In cases where direct marking of a component of a kit is not possible, the holder of the ETA must ensure that users can identify that component as part of the kit by other suitable means.

¹ Official Journal of the European Communities No L220/1, Council Directive 93/68/EEC dated 22 July 1993.

Section four : ETA CONTENT

9. THE ETA CONTENT

9.1. The ETA-content

The ETA content shall be in accordance with the Commission Decision 97/571/EC, dated 22 July 1997.

In section II.2 “characteristics of products and methods of verification“ the ETA shall include the following note:

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

The period of validity of an ETA issued under this ETAG shall be 5 years.

9.2 Proposal for an ETA

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This ETA is issued by (*name of the Approval Body*) in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products², modified by Council Directive 93/68/EEC³ and Regulation (EC) N°1882/2003 of the European Parliament and of the Council⁴;
 - ETA Guideline 033 *Liquid applied bridge deck waterproofing kits*
- 2 The (*name of the Approval Body*) is authorized to check whether the provisions of this ETA are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products with the ETA and with their fitness for the intended use remains with the holder of the ETA.
- 3 This ETA is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this ETA.
- 4 This ETA may be withdrawn by (*name of the Approval Body*), in particular pursuant to information by the Commission according to Article 5.1 of Council Directive 89/106/EEC.
- 5 Reproduction of this ETA including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of (*name of the Approval Body*). In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the ETA.
- 6 The ETA is issued by the Approval Body in its official language. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

2 Official Journal of the European Communities N° L 40, 11.2.1989, p. 12

3 Official Journal of the European Communities N° L 220, 30.8.1993, p. 1

4 Official Journal of the European Union N°L 284, 31.10.2003, p. 25

II SPECIFIC CONDITIONS OF THE ETA

1 Definition of product and intended use

1.1 Definition of the construction product

The liquid applied bridge deck waterproofing system "*trade name of the kit*" is a kit which consists of (Include a full description of the kit and identify all components of the kit including possible variations).

As an assembled system these components form a homogeneous, continuous bridge deck waterproofing (include use category).

Annex 1 shows the components and the system build-up of the bridge deck waterproofing system ... (*trade name of the kit*).

The minimum thickness of the bridge deck waterproofing applied amounts to (x.y) mm.

The overlay of the bridge deck waterproofing consists of (*kind of protection layer and/ or finish layer if applicable*).

1.2 Intended use

The product is used for the tightness of concrete bridge decks against penetration of water. It is intended for uses where requirements concerning hygiene, health and the environment and safety in use as well as the durability in the sense of the essential requirements N° 1, 3 and 4 of the Directive 89/106/EEC shall be satisfied.

The product shows certain levels of performance according to the test categories of ETAG xxx⁵ which facilitate the use taking account of national requirements (see chapter 2.1 and Annex 1).

In the manufacturer's technical dossier⁶ (MTD) to this ETA (ETA) the manufacturer gives specific information concerning the application of the product.

The verifications which are the basis of this ETA give reason for the assumption of an intended working life of the bridge deck waterproofing of 25 years, provided that the bridge deck waterproofing kit is subject to appropriate installation, use and maintenance. These provisions are based upon the current state of the art and the available knowledge and experience.

"Assumed intended working life" means that it is expected that, when this working life has elapsed, the real working life may, under normal use conditions, be considerably longer without major degradation affecting the essential requirements.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

⁵ "Guideline for European Technical Approval of liquid applied bridge deck waterproofing kits (ETAG 033), publication of xxx, "*Liquid applied bridge deck waterproofing kits*", *Official Journal of the European Communities* N°C xxxxxx.

⁶ The MTD comprises all information necessary for the production and the installation of the product as well as for the repair of the bridge deck waterproofing made from that. It was checked by (*name of Approval Body*) and it was found to be in accordance with the conditions stated in the approval and the characteristic values determined during the approval testing.

The part of MTD to this ETA to be treated confidentially (inter alia the Control Plan for factory production control) is deposited with (*name of Approval Body*) and, as far as this is relevant to the tasks of the notified body involved in the procedure of attestation of conformity, shall be handed over to the notified body.

2 Characteristics of product and methods of verification

2.1 Characteristics of the construction product

The verified characteristic values of the Kit are stated as performance levels in Annex 1 of this ETA. These values can be used to assess whether the requirements of the Member State of destination, for a specific use, are met.

The components of the product shall show the characteristic values with respect to the permissible tolerances which are stated in the MTD to this ETA.

The chemical composition and the characteristic values of the components of the kit and the manufacturing methods are confidential and deposited with (*Approval Body*).

2.2 Methods of verification

Assessment of the fitness of the bridge deck waterproofing for the intended use with regard to the essential requirements N° 1, 3 and 4 was performed following the "Guideline for ETA of liquid applied bridge waterproofing kits" (*ETAG 033*).

According to the manufacturer's declaration the bridge deck waterproofing taking account of the EU database does not contain any dangerous substances.

Within the scope of this approval there may be other requirements applicable to dangerous substances resulting from transposed European legislation or applicable national laws, regulations and administrative provisions.

There may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 2003/722/EC of the European Commission⁷ the system 2+ of attestation of conformity applies.⁹

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer:

- (1) initial type-testing of the product;
- (2) factory production control;
- (3) testing of samples taken at the factory in accordance with a prescribed test plan.

(b) Tasks for the notified body:

- (4) certification of factory production control on the basis of:
 - initial inspection of factory and of factory production control;
 - continuous surveillance, assessment and approval of factory production control.

⁷ Official Journal of the European Communities L 260 of 11/10/2003

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Initial type-testing of the product

The Initial type-testing refers to the product properties stated in the Control Plan⁸ to this ETA. If the verifications underlying this ETA have been furnished on samples from the current production process of the manufacturer, these will be used for the purpose of Initial type testing and further tests are not necessary. Otherwise the necessary initial type-testing shall be carried out according to the provisions of the Control Plan and observance of the required property values shall be ascertained by the manufacturer.

If the production process is changed or if a new production line is started at the beginning of the new production process an additional Initial type test is necessary.

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this ETA.

The factory production control (FPC) shall be in accordance with the Control Plan which is part of the MTD to this ETA. The FPC follows the given fundamental specifications of the ETAG (xxx).The "testing of samples taken at the factory in accordance with a prescribed test plan" is part of the FPC.

The manufacturer may only use incoming materials stated in the MTD to this ETA. He shall inspect or control the incoming materials on acceptance according to the Control Plan.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the Control Plan.

The records shall include at least the following information:

- Name of the product and of the incoming materials,
- type of inspection or control,
- date of manufacture of the product, batch N° if needed, and date of inspection or control of the product or of the incoming materials,
- result of inspections or controls and, as far as applicable, comparison with the requirements stated in the MTD
- signature of the person responsible for the factory production control.

The records shall be kept for at least five years. On request they shall be presented to ... (*name of Approval Body*).

Details concerning extent, type and frequency of the tests or inspections to be performed within the scope of the factory production control shall correspond to the Control Plan.

3.2.1.3 Other tasks for manufacturer

The manufacturer shall, on the basis of a contract, involve a body / bodies which is (are) notified for the tasks referred to in section 3.1 in the field of the ...(*product*) in order to undertake the actions laid down in section 3.3. For this purpose, the Control Plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the notified body / bodies involved.

When all the criteria of the Conformity Attestation on the basis of the tasks of the manufacturer and the tasks of the notified body (see 3.2.2) are satisfied the manufacturer shall make a declaration of conformity, stating that the product is in conformity with the provisions of this ETA has to assign the CE mark to the product (see 3.3).

⁸ The Control Plan is a confidential part of the MTD and deposited with (*name of Approval Body*); it contains the required information on the factory production control and on the initial type-testing. As far as this is relevant to the tasks of the notified body involved in the procedure of attestation of conformity the Control Plan will be handed over to the notified body.

3.2.2 Tasks for notified bodies

The notified body/bodies shall perform the

- initial inspection of factory and of factory production control,
 - continuous surveillance, assessment and approval of factory production control,
- in accordance with the provisions laid down in the Control Plan.

The notified body/bodies shall retain the essential points of its/their actions referred to above and state the results obtained and conclusions drawn in a written report/written reports.

The notified certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this ETA.

In cases where the provisions of the ETA and its Control Plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform ...(*name of issuing Approval Body*) without delay.

3.2.2.2 Initial inspection of factory and production control

The notified body ascertains that, in accordance with the MTD, factory conditions and production control allow the manufacturer to ensure the consistency and homogeneity of the manufactured product and its trace ability, thus guaranteeing that the final characteristics of the product are those indicated under chapter 2.

3.2.2.3 Continuous surveillance, assessment and approval of Factory Production Control

The notified body shall visit the factory at least once a year but if necessary i.e. if the results of any inspection give rise to any remarks additional inspections may be required.

The Surveillance of the manufacturing process shall include:

- Checking the documentation of factory production control, to ensure continuing compliance with the provisions of the ETA,
- Identification of changes by comparing data obtained during the initial inspection or during the last inspection.

In the event the ETA provisions are not complied with, the certificate of conformity shall be withdrawn and the *Approval Body* shall be informed without delay.

3.3 CE marking

The CE mark⁹ shall be affixed on the packaging of the kit components or its accompanying documents.

The letters 'CE' shall be followed by the identification number of the notified certification body and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the ETA,
- the number of the ETA Guideline (ETAG 033)

The components must be identified as belonging to the kit ...(*name of product*)

⁹ See Council Directive 93/68/ECC,

Notes on the CE marking are stated in Guidance Paper D of the European Commission "CE marking under the Construction Products Directive", Brussels 01 January 2002.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The components of the kit of the bridge deck waterproofing ... (*name of product*) are factory-made according to the procedure laid down in the MTD.

The ETA is issued for the product on the basis of agreed data/information, deposited with the ... (*name of Approval Body*), which identifies the product that has been assessed and judged. Changes to the kit, components or the production process, which could result in this deposited data/information being incorrect, must be notified to the (*name of Approval Body*) before the changes are introduced. The(*name of Approval Body*) will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA are necessary.

4.2 Design and dimensioning

The fitness for the use of the bridge deck waterproofing kit results from the proved performance levels stated in Annex 1, if need be, taking account of national requirements.

The supplementing statements of the manufacturer stated in the MTD for design and dimensioning of the bridge deck waterproofing shall be considered.

In the MTD the manufacturer gives information on the quantities consumed and the processing of the various layers necessary to achieve the required thickness of at least ... (x.y) mm.

4.3 Installation

The fitness for use of the bridge deck waterproofing kit can be assumed only, if the installation is carried out according to the installation instructions stated in the MTD by the manufacturer, in particular taking account of the following points:

- Installation by appropriately trained personnel,
- installation of only those components which are marked components of the kit,
- installation with the required tools,
- precautions during installation,
- specific guidance on process control on site, where required,
- inspecting the substrate for cleanliness, acceptable surface structure and correct preparation before applying the product,
- inspecting compliance with suitable weather and curing conditions,
- ensuring a thickness of the watertight covering of at least ...xxx mm by processing appropriate minimum quantities of material,
- inspections during installation and of the finished product and documentation of the results.

The information as to the

- method of repair on site,
- handling of waste products
- maximum and minimum application temperature of the asphalt for the overlay shall be observed.

4.4 Manufacturer's responsibilities

It is the manufacturer's responsibility to make sure that all those who use the kit, e.g. designer, specifier, installer etc will be appropriately informed about the specific conditions according to sections 1, 2, 4, and 5 including the Annex to this ETA and the not confidential parts of the MTD deposited to this ETA.

5 Other information to be provided by the manufacturer

5.1 Packaging, transport and storage

Information on:

- Packaging
- transport and
- storage

are given in the MTD.

5.2 Safety measures, maintenance and repair

Information on:

- Safety measures
- maintenance
- repair

are given in the MTD.

Signature of the Approval Body

Example of Annex 1 to ETA

1.1 DESCRIPTION OF PRODUCT

(Specific text and drawings of the components, as far as relevant, and the assembled system)

1.2 ADDITIONAL INFORMATION

The proved performance of the product is given using the keys for the categories of the test conditions given in Chapter 5 and Annex D of ETAG 033 for sample preparation, for stress conditions before testing and for temperature conditions for testing.

As an example a possible product designation is given:

Characteristic	Proved under test conditions (P,S,T) ⁽¹⁾	Value pass NPD
Bond strength of kit to support	P1, T5 P1, FT, T5 P2, T5 P1, MA, T5 P3, T5 P4, T5 P1, S2, T5	1,3 MPa 1,0 MPa 1,2 MPa 0,8 MPa NPD 1,2 MPa NPD
Capacity to bridge cracks	P1, S2, T2 P1, S4, T2	pass pass
Resistance to shear of assembled system to support	P1, S1.1, T5 P1, S1.1/S3, T5	0,40 MPa 0,37 MPa
Resistance to shear of assembled system to overlay	P1, S1.2, T5 P1, S1.2/S3, T5	0,3 MPa 0,27 MPa
Bond strength of assembled system to overlay	P1, S1.2, T5	1,0 MPa
Water tightness	P1, T5	pass
Resistance to Cl ⁻ penetration	-	NPD
Resistance to compaction	-	NPD
Slipperiness	-	NPD
Materials in contact (Change of micro hardness)	Wa Al Bi	+7 IRHD -3 IRHD +2 IRHD
Materials in contact (Change in mass)	Wa Al	+ 8 % -2 %
Materials in contact (Assessment)	Oil, petrol, diesel, de-icing salt	Satisfactory
Change of tensile characteristics	P1, S1.1, T5 P1, S2, T5	-3 Mpa, -10% + 2 Mpa, -20%
Abrasion, wear	-	NPD
Capacity to penetrate pores	-	NPD
Resistance to flow	P1, T5	pass

Note 1 Categories of sample preparation (Pi), stress conditions before testing (Si) and test temperature (Ti) are defined in Annex D of this ETAG.

ANNEX A

COMMON TERMINOLOGY (definitions, clarifications, abbreviations)

1. WORKS AND PRODUCTS

1.1 Construction works (and parts of works) (often simply referred to as "works") (ID 1.3.1)
Everything that is constructed or results from construction operations and is fixed to the ground.
(This covers both building and civil engineering works, and both structural and non structural elements).

1.2 Construction products (often simply referred to as "products") (ID 1.3.2)
Products which are produced for incorporation in a permanent manner in the works and placed as such on the market.
(The term includes materials, elements and components of prefabricated systems or installations)

1.3 Incorporation (of products in works) (ID 1.3.2)
Incorporation of a product in a permanent manner in the works means that:
- its removal reduces the performance capabilities of the works, and
- that the dismantling or the replacement of the product are operations which involve construction activities.

1.4 Intended use (ID 1.3.4)
Role(s) that the product is intended to play in the fulfilment of the essential requirements.
(*N.B. This definition covers only the intended use as far as relevant for the CPD*)

1.5 Execution (ETAG-format)
Used in this document to cover all types of incorporation techniques such as installation, assembling, incorporation, etc.

1.6 System (EOTA/TB guidance)
Part of the works realised by
- particular combination of a set of defined products, and
- particular design methods for the system, and/or
- particular execution procedures.

2. PERFORMANCES

2.1 Fitness for intended use (of products) (CPD 2.1)
Means that the products have such characteristics that the works in which they are intended to be incorporated, assembled, applied or installed, can, if properly designed and built, satisfy the essential requirements.
(*N.B. This definition covers only the intended fitness for intended use as far as relevant for the CPD*)

2.2 Serviceability (of works)
Ability of the works to fulfil their intended use and in particular the essential requirements relevant for this use.

The products must be suitable for construction works which (as a whole and in their separate parts) are fit for their intended use, subject to normal maintenance, be satisfied for an economically reasonable working life. The requirements generally concern actions which are foreseeable (CPD Annex I, Preamble).

2.3 Essential requirements (for works): requirements applicable to works, which may influence the technical characteristics of a product, and are set out in terms of objectives in the CPD, Annex I (CPD, art. 3.1).

2.4 Performance (of works, parts of works or products) (ID 1.3.7)
The quantitative expression (value, grade, class or level) of the behaviour of the works, parts of works or of the products, for an action to which it is subject or which it generates under the intended service conditions (works or parts of works) or intended use conditions (*products*).

As far as practicable the characteristics of products, or groups of products, must be described in measurable performance terms in the technical specifications and Guidelines for ETA. Methods of calculation, measurement,

testing (where possible), evaluation of site experience and verification, together with compliance criteria shall be given either in the relevant technical specifications or in references called up in such specifications.

2.5 Actions (on works or parts of the works) (ID 1.3.6)

Service conditions of the works which may affect the compliance of the works with the essential requirements of the Directive and which are brought about by agents (mechanical, chemical, biological, thermal or electro-magnetic) acting on the works or parts of the works.

Interactions between various products within a work are considered as "actions".

2.6 Classes or levels (for essential requirements and for related product performances) (ID 1.2.1)

A classification of product performance(s) expressed as a range of requirement levels of the works, determined in the ID's or according to the procedure provided for in Art. 20.2a of the CPD.

3. ETAG - FORMAT

3.1. Requirements (for works) (ETAG-format 4.)

Expression and application, in more detail and in terms applicable to the scope of the Guideline, of the relevant requirements of the CPD (given concrete form in the ID's and further specified in the mandate, for works or parts of the works, taking into account the durability and serviceability of the works.

3.2 Methods of verification (for products) (ETAG-format 5.)

Verification methods used to determine the performance of the products in relation to the requirements for the works (calculations, tests, engineering knowledge, evaluation of site experience, etc.).

These verification methods are related only to the assessment of, and for judging the fitness for use of products. Verification methods for particular designs of works are called here "project testing", for identification of products are called "identification testing", for surveillance of execution or executed works are called "surveillance testing", and for attestation of conformity are called "AC-testing".

3.3 Specifications (for products) (ETAG-format 6.)

Transposition of the requirements into precise and measurable (as far as possible and proportional to the importance of the risk) or qualitative terms, related to the products and their intended use. *The satisfaction of the specifications is deemed to satisfy the fitness for use of the products concerned.*

Specifications may also be formulated with regard to the verification of particular designs, for identification of products, for surveillance of execution or executed works and for attestation of conformity, when relevant.

4. WORKING LIFE

4.1 Working life (of works or parts of the works) (ID 1.3.5(1))

The period of time during which the performance will be maintained at a level compatible with the fulfilment of the essential requirements.

4.2 Working life (of products)

Period of time during which the performance characteristics of the product are maintained - under the corresponding service conditions - at a level compatible with the intended use conditions.

4.3 Economically reasonable working life: (ID 1.3.5(2))

Working life which takes into account all relevant aspects, such as costs of design, construction and use, costs arising from hindrance of use, risks and consequences of failure of the works during its working life and cost of insurance covering these risks, planned partial renewal, costs of inspections, maintenance, care and repair, costs of operation and administration, of disposal and environmental aspects.

4.4 Maintenance (of works) (ID 1.3.3(1))

A set of preventive and other measures which are applied to the works in order to enable the works to fulfil all its functions during its working life. These measures include cleaning, servicing, repainting, repairing, replacing parts of the works where needed, etc.

4.5 Normal maintenance (of works) (ID 1.3.3(2))

Maintenance, normally including inspections, which occurs at a time when the cost of the intervention which has to be made is not disproportionate to the value of the part of the works concerned, consequential costs (e.g. exploitation) being taken into account.

4.6 Durability (of products)

Ability of the product to contribute to the working life of the work by maintaining its performances, under the corresponding service conditions, at a level compatible with the fulfilment of the essential requirements by the works.

5. CONFORMITY

5.1 Attestation of conformity (of products)

Provisions and procedures as laid down in the CPD and fixed according to the directive, aiming to ensure that, with acceptable probability, the specified performance of the product is achieved by the ongoing production.

5.2 Identification (of a product)

Product characteristics and methods for their verification, allowing a given product to be compared with the one that is described in the technical specification.

6. APPROVAL AND APPROVED BODIES

6.1 Approval Body

Body notified in accordance with Article 10 of the CPD, by an EU Member State or by an EFTA State (contracting party to the EEA Agreement), to issue ETAs in (a) specific construction product area(s). All such bodies are required to be members of the European Organisation for Technical Approvals (EOTA), set up in accordance with Annex II.2 of the CPD.

6.2 Approved Body(*)

Body nominated in accordance with Article 18 of the CPD, by an EU Member State or by an EFTA State (contracting party to the EEA Agreement), to perform specific tasks in the framework of the Attestation of Conformity decision for specific construction products (certification, inspection or testing). All such bodies are automatically members of the Group of Notified Bodies.

(*) also known as Notified Body

ABBREVIATIONS

Concerning the Construction products directive:

AC: Attestation of conformity

CEC: Commission of the European Communities

CEN: Comité européen de normalisation / European Committee for Standardization

CPD: Construction products directive

EC: European communities

EFTA: European free trade association

EN: European standard

FPC: Factory production control

ID: Interpretative documents of the CPD

ISO: International standardisation organisation

SCC: Standing committee for construction of the EC

Concerning approval:

EOTA: European organisation for technical approvals

ETA: European Technical Approval

ETAG: European technical approval Guideline

TB: EOTA-Technical Board

UEAtc: Union européenne pour l'agrément technique / European union of agrément

General:

TC: Technical committee

WG: Working group

ANNEX B

SPECIMEN PREPARATION

Test Specimens shall be prepared in accordance with EN 13375: 2004 *Flexible sheets for waterproofing, Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles Specimen preparation*, with the following exceptions:

3 Definitions

3.1 Sample: For the purposes of this ETAG a sample can be either:

- a) in the case of Type 1, Type 3, Type 4 or Type 5 Specimens, the waterproofing layer applied to the support, or
- b) in the case of Type 2 Specimens a free film of the waterproofing layer from which a test piece is taken.

3.5 Specimens

- Type 1: Liquid applied waterproofing layer bonded to the support;
- Type 2: Free film liquid applied waterproofing layer;
- Type 3: Liquid applied waterproofing layer bonded to the support and coarse bituminous overlay applied at $(160\pm 10)^{\circ}\text{C}$ (CBM) .
- Type 4: Liquid applied waterproofing layer bonded to the support and mastic asphalt overlay applied at $(250\pm 10)^{\circ}\text{C}$ (MA).
- Type 5a: Liquid applied waterproofing layer bonded to the support and mastic asphalt overlay applied at $\text{LMA}_{\text{min}} < 220^{\circ}\text{C}^{(1)}$.
- Type 5b: Liquid applied waterproofing layer bonded to the support and mastic asphalt overlay applied at $\text{LMA}_{\text{max}} < 250^{\circ}\text{C}$

Note1: In order to apply a mastic asphalt overlay at $< 220^{\circ}\text{C}$ it may be necessary to modify the mastic asphalt.

4 Specimen

The first paragraph shall be replaced by:

Specimens for the different performance related tests are defined in the relevant test methods given in this ETAG.

Table 1 and the related text do not apply to this ETAG.

6 Application of the waterproofing system

This clause does not apply to this ETAG and shall be replaced by:

6 Sample preparation

6.1 Application of the liquid applied waterproofing layer to the support (Type 1, Type 3, Type 4 and Type 5 specimens).

The liquid applied waterproofing layer, including any priming coats, bonding coats or tack coats shall be applied to the support specimen in accordance with the manufacturer's instructions, paying particular attention to required ambient temperature and relative humidity conditions. The specific conditions for sample preparation are defined in chapter 5 of this ETAG under the specific clause relating to the characteristic to be verified.

The sample shall be allowed to cure under controlled conditions for a period of not less than that specified by the manufacturer and not longer than 28 days.

The required number of test specimens may either be cut from a larger sample or applied to the appropriate number of support specimens. In the latter case it might be advantageous to hold the support specimens together in a rigid frame during application.

After curing, and when required (Type 3, Type 4 and Type 5 specimens), the asphalt layer shall be applied in accordance with clause 7.2 of EN 13375: 2004. Precautions shall be taken to avoid the influence of vibration during compaction, for example the concrete slabs may be laid on flat ground using a soft intermediate layer (e.g. sand).

6.2 Preparation of Free Film Samples (Type 2 Specimens)

The method of free film sample preparation may differ with the kit under examination and the advice of the manufacturer shall be sought on the most appropriate method to be used with the materials.

A rigid support (e.g. of plywood, glass, plastic coated chipboard or MDF) of sufficient size to provide an even and stable support on which to prepare the sample(s) shall be placed on a firm support ensuring that it is horizontal.

A release agent, to avoid adhesion to the support and to allow subsequent removal of the sample, shall be applied to the support and, where necessary, allowed to dry. Examples of release agents known to work are siliconised paper, spray furniture polish, spray silicone release agent and microcrystalline paraffin wax.

Where sheet release films are used, these shall be firmly fixed to the support without creases or wrinkles.

The liquid applied bridge deck waterproofing kit shall be applied in the appropriate number of coats, including reinforcement, where appropriate, in accordance with the manufacturer's instructions (by spraying, spreading or brushing) to the prepared support. For two-coat brush-applied liquid applied bridge deck waterproofing kits the manufacturer's instructions for the direction of brushing shall be followed.

The waterproofing layer shall be applied at a thickness within the range declared by the manufacturer.

For crack bridging (5.1.1.2), compaction (5.1.1.4.1) and watertightness (5.1.1.8) and chloride ion test (5.1.1.3) the waterproofing layer shall be applied at the minimum thickness of the declared range.

For resistance to shear (5.1.4.2) and (5.1.1.7) the waterproofing layer shall be applied at the maximum thickness of the declared range.

The mean thickness of the applied membrane shall be controlled in the appropriate manner, for example by means of wet film gauges, film spreaders, film casters, bar coaters or steel frames.

The sample shall be allowed to cure under controlled conditions for a period of not less than that specified by the manufacturer and not longer than 28 days.

After curing the sample shall be removed, without straining, from the support. Any area of free film falling outside the manufacturer's thickness specification shall be rejected.

6.3 Measurement of coating thickness

Thickness measurements are carried out in accordance with EN ISO 2808.

6.4 Preparation of test specimens to verify the bond strength between the assembled system and support at the most unfavourable conditions of application of temperature and relative hygrometry called "limiting conditions".

The test is carried out in a climatic chamber able to respect the "limiting conditions" with an accuracy of $\pm 2^{\circ}\text{C}$ for the temperature and $\pm 10\%$ for the hygrometry.

The support shall be conditioned 7 days in a climatic chamber at the "limiting conditions" which the manufacturer claims for his product.

The components of the kit shall be maintained at the conditions for storage stated by the manufacturer.

Application of each component shall be carried out in the climatic chamber or outside at ambient temperature, avoiding water condensation on the substrate.

The sample shall be allowed to cure at the limiting conditions declared by the manufacturer for a minimum period specified by him.

After this conditioning, the samples are brought back gradually to the test temperature (23 ± 3)°C by successive steps of 5 °C per 24 hours.

The samples are maintained at ambient temperature and the bond strength test is carried out in accordance with EN 13596: 2004 at 11 days starting from the date of mixing of the components.

9 Storing

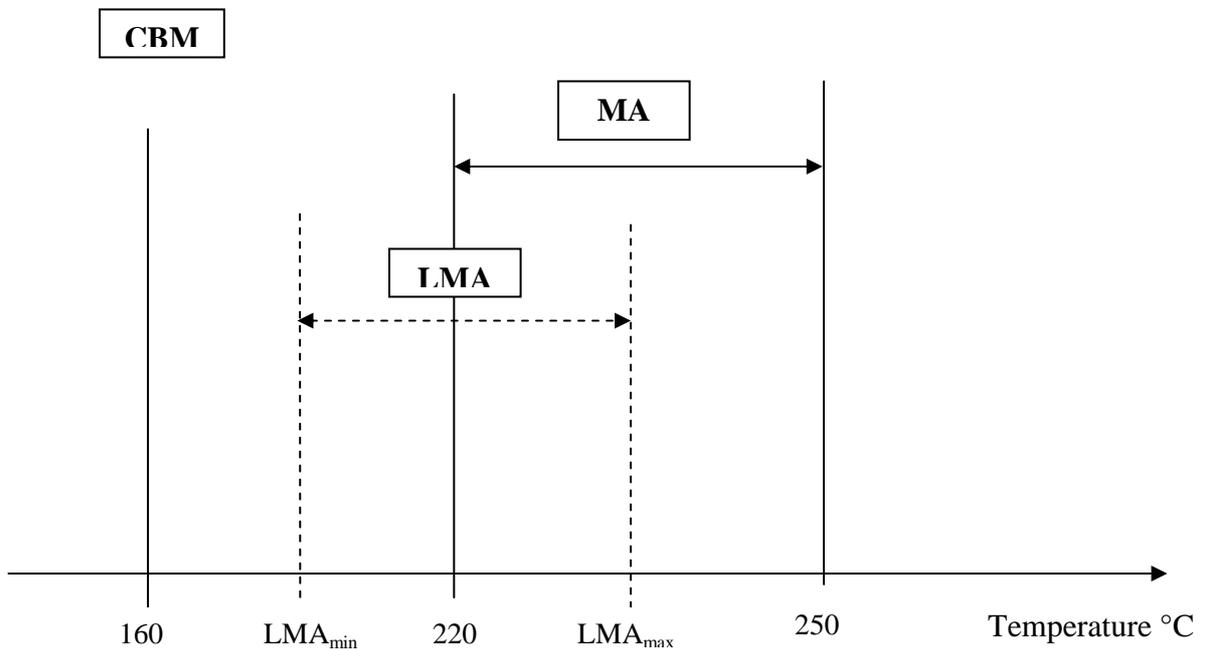
This clause does not apply to this ETAG and shall be replaced by:

The test specimens shall be stored under laboratory conditions as defined in the appropriate standard. The tests shall be commenced in the period between 24 hours and 3 months after the end of the curing period.

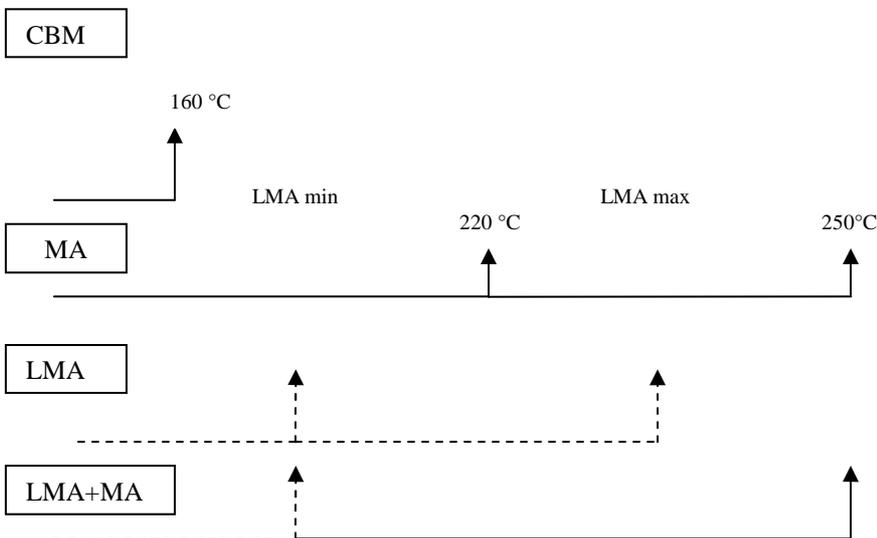
ANNEX B1

Specimen preparation for determining the effect of heat impact caused by the application of a hot-applied asphalt overlay on the waterproofing layer

<u>Specimen type 3</u>	CBM	Coarse bituminous mixture applied at $160 \pm 10^\circ\text{C}$ (fixed),
<u>Specimen type 4</u>	MA	Mastic asphalt applied between 220 and 250°C (fixed),
<u>Specimen types 5a/b</u>	LMA	Low temperature mastic asphalt –applied at a minimum temperature $< 220^\circ\text{C}$ (LMA_{\min}), type 5a, and a maximum temperature $< 250^\circ\text{C}$ (LMA_{\max}), type 5b, (variable); The variable range of temperature shall declared by the manufacturer



Possible choices of manufacturer:



ANNEX C

COMPONENT CHEMISTRIES

Components used in liquid applied systems for waterproofing bridge decks can broadly be classified into the following six categories based on their chemistry:

polyurethane
polyurea
unsaturated polyester
epoxy
acrylic
water dispersible polymers

This ETAG assumes that the currently available materials are based on the above chemistries. For information, a brief description of each is given below:

Polyurethane

Polyurethanes (PU) are polymers containing significant number of urethane groups (–NH–CO–O–) in the molecular chain. Polyurethanes are formed by reacting a diisocyanate and a polyol. In a two-component system, one component normally contains the polyol, pigments, and additives and the second component contains the polyisocyanate. The reaction can be catalysed by the use of organotin catalysts.

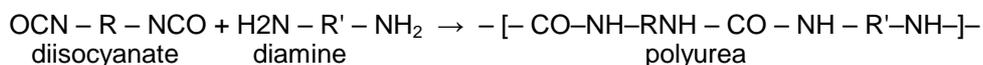
Toluene diisocyanate, diphenyl methane diisocyanate, hexamethylene diisocyanate, xylene diisocyanate and isophorone diisocyanate are the most widely used isocyanates in polyurethane synthesis. The most widely used polyhydroxy compounds, commonly known as polyols, in polyurethane synthesis are hydroxyl-terminated polyether and polyester, polyolefins and glycols.

Depending on the type of polyol and the polyisocyanate selected, the coating properties can be modified to meet the specific needs for different applications. The two components are mixed together immediately before the application. There is a limited time (pot life) when the viscosity of the coating is low enough for application. The curing process is affected by temperature.

Isocyanates and specialised 'latent' curing agents also react with water making it possible to formulate one-component systems that cure when exposed to atmospheric moisture.

Polyurea

Polyureas are formed by the reaction between a diisocyanate component and a resin blend component, based on amine-terminated resins



The most commonly used isocyanate is diphenylmethane diisocyanate (MDI). Aliphatic isocyanates are used where improved UV-stability is required..

The amine blend used is normally a mixture of polyetheramines and chain extenders.

Polyureas are characterized by very fast cure, even at temperatures well below 0 °C. For this reason, the most important element of handling polyureas is the mixing; usually, the products are mixed by impingement at high pressure.

Note : The water/isocyanate reaction also produces urea – groups at the end of the process. However, this reaction should not be considered a polyurea reaction since the mechanism is a two-step process the rate of which is governed by the slower isocyanate/water reaction, and produces carbon dioxide.

Unsaturated Polyester

The base material for a thermoset polyester matrix is an unsaturated polyester resin that contains a number of C = C double bonds. The polymer is dissolved in a reactive (polymerizable) solvent, such as styrene, which reduces its viscosity and makes it easier to handle. Small amounts of an inhibitor, such as hydroquinone or benzoquinone can be added to the liquid mix to prevent premature polymerization during storage.

The curing reaction for polyester resins is initiated by adding small quantities of a catalyst, such as organic peroxide to the liquid mix. The catalyst decomposes rapidly into free radicals, which react with the styrene molecules and break their double bonds. Styrene radicals, in turn, join with the polyester molecules at their unsaturation points and eventually form cross-links between them. The decomposition rate of a catalyst can be increased by adding small quantities of accelerator. Given enough time an unsaturated polyester resin will set by itself. The rate of polymerisation is too slow for practical purposes and therefore catalysts and accelerators are used to achieve the polymerisation of the resin within a practical time period.

Catalysts are added to the resin system a short time before use to initiate the polymerisation reaction. The catalyst does not enter into the chemical reaction but simply activates the process. An accelerator is added to the catalysed resin to enable the reaction to proceed at room temperature and/or at a greater rate. Since accelerators have little influence on the resin in the absence of a catalyst they are sometimes added to the resin by the polyester manufacturer to create a "pre-accelerated" resin. With the addition of styrene, and in the presence of a catalyst, the styrene cross-links the polymer chains at each of its reactive sites to form a highly complex three-dimensional network.

Formulated polyester resins normally include the addition of several ancillary products that can include catalysts, accelerators, additives e.g. thixotropic agents, pigments and fillers.

Epoxy

Base materials for epoxy matrix are low-molecular-weight organic liquid resins containing a number of epoxide groups.

The term "epoxy" refers to a chemical group consisting of an oxygen atom bonded to two carbon atoms that are already bonded in some way. The most common base material used is di-glycidylether of bisphenol A which contains two epoxide groups, one at each end of the molecule. Other ingredients may be mixed with the base liquid, such as diluents to reduce its viscosity or flexibilizers to improve the impact strength of the cured epoxy matrix.

Epoxyes are cured by a "hardener". Amines are the most commonly used curing agents. Primary and secondary amines are highly reactive with epoxy. Tertiary amines are generally used as catalysts, commonly known as accelerators for cure reactions. The hardener is used to cure the epoxy by an "addition reaction" where both materials come together in the chemical reaction.

The curing process is a chemical reaction in which the epoxide groups in epoxy resin reacts with a curing agent (hardener) to form a highly cross-linked, three-dimensional network. The chemistry of this reaction means that there are usually two epoxy sites binding to each amine site. This forms a complex three-dimensional molecular structure. Hydrogen atoms in the amine (NH₂) groups of a molecule react with the epoxide groups. As the reaction continues, these molecules form crosslinks with each other and a three-dimensional network structure is slowly formed.

The properties of a cured epoxy resin depend principally on the cross-link density.

Acrylic

Poly(methylmethacrylate) (PMMA) is produced by the polymerisation of the liquid monomer methylmethacrylate (MMA) via a free radical mechanism.

Methylmethacrylate and copolymers are mixed with various additives.

The monomer (methacrylate) will be used as a reactive solvent with various polymers and react with them under addition of a catalyst (peroxide). The polymerization of MMA is most commonly initiated by using thermal radical-forming agents which will be most often organic peroxy compounds. The reaction (polymerisation) of methylmethacrylate in the MMA/PMMA dough can be activated by unstable organic peroxide, which decomposes to form phenyl free-radicals. Thus methacrylate or polymethacrylate systems are cured by free-radical polymerisation. The catalyst is added before use.

To obtain higher methacrylate esters, methacrylic acid is esterified with the relevant alcohols. Longer-chain methacrylate esters are also synthesized by trans-esterification of MMA.

Water dispersible polymers

Water dispersible polymers consist of a dispersion of polymer particles in water. The polymer film is formed on the evaporation of the water. Additives e.g. emulsion breaking agents can be added to accelerate the process.

ANNEX D

TEST CATEGORIES

1 General

The test categories reflect all the possible test conditions and preconditioning regimes as they currently exist within the Member States. To bring a kit on the market of one, several or all Member States the Approval Body shall issue an ETA which considers the specific required conditions of these Member States. The choice of which Member State(s) the kit is aimed at remains the choice of the manufacturer.

The following test types of test categories are addressed:

- Five test categories associated with conditions for preparation of samples (P)
- Five test categories associated with stress conditions before testing (S)
- Six test categories associated with temperature conditions for testing (T)

The test categories are defined within the text of chapter 5 and are summarized in this Annex. Table D1 gives an overview of links between characteristics to be proved and the possible test categories on the basis of this ETAG. Table D1 may also be used to develop a test programme with respect to the assessment requirements of one, several or all Member States in which the kit shall be marketed.

2 Categories of conditions for sample preparation (Pi)

These categories are related to different conditions under which the samples may be prepared. These are different climate conditions and specified conditions of the substrate.

2.1 Normal application climate (NC) – P1

To realise "normal" application conditions on site the samples will be prepared (coating of the concrete slabs or producing a free film) under normal climate conditions, P1 (23 ± 2)°C and (50 ± 10)% rh)

2.2 Severe application climate (SC) – P2

To realise severe application conditions at lower or higher temperatures in combination with high relative humidity on site, the samples shall be prepared (coating of the concrete slabs) at the minimum and/or maximum climate conditions given by the manufacture for his product, P2 (see ETAG clause 5.1.7.2.5)

2.3 High moisture content of the substrate (MC) – P3

Special application conditions may be given when the waterproofing system is applied on concrete with high moisture content e.g. on concrete 7 days (see ETAG clause 5.1.7.2.6.1).

2.4 Overlapping areas (OA) – P4

If sub areas are carried out on which a new area is connected by overlapping after a period of weathering (UV) up to 7 days (day joints) or up to six months (Section joints) it may be necessary to prove that these areas have the same adhesion to the support as the surrounding area (see ETAG clause 5.1.7.2.6.2/3).

3 Categories of stress conditions before testing (Si)

These categories are related to stress conditions which can affect the function of the waterproofing system. Test may be performed after the following preconditioning.

3.1 No stress conditions – S0

To investigate the influences of stress conditions comparable tests may also be done also without any stress before testing

3.2 Heat impact- S1

The heat impact by the application of hot overlays on the applied waterproofing system is divided in sub categories:

S 1.1, Application of Mastic asphalt at $\geq 220^{\circ}\text{C}$ up to 250°C - (MA) (declared by the manufacturer)

S 1.2, Application of low temperature Mastic asphalt (LMA)

S 1.2.1 Application of Mastic asphalt at $< 220^{\circ}\text{C}$ (L MAmin) (declared by the manufacturer)

S 1.2.2 Application of Mastic asphalt at $< 250^{\circ}\text{C}$ (L MAmax) (declared by the manufacturer)

S 1.3, Compaction of coarse bituminous mixture at 160°C - (CBM)
(see ETAG clause 5.1.1.5).

3.3 Heat ageing (HA) – S2

Ageing of materials under the influence of high temperatures (see ETAG clause 5.1.7.1.3.1)

3.4 Freeze-Thaw (FT) – S3

Freeze-Thaw cycles on the applied waterproofing system (see ETAG clause 5.1.7.1.3.2).

3.5 UV radiation (UV) – S4

Influences of ambient weather conditions on exposed systems under UV radiation including water spray. (see ETAG clause 5.1.7.1.4)

3.6 Materials in contact – S5

Influence of:

S 5.1, water (Wa)

S 5.2, alkali (Al)

S 5.3, bitumen (Bi)

on specified product characteristics (see ETAG clause 5.1.7.1.2)

4 Categories of temperature conditions for testing (Ti)

These categories are related to the temperature conditions which may have an influence on the result of the tests. These categories cover a range from high to extreme low temperatures under which the characteristics of the waterproofing system shall be proved.

4.1 Extreme low temperature (-30°C) – T1

For systems which are in use at extreme low temperatures tests may be performed at -30°C (see ETAG clause 5.1.7.2.1)

4.2 Severe low temperature (-20°C) – T2

For systems which are in use at severe low temperatures tests shall be performed at -20°C (see ETAG clause 5.1.7.2.1)

4.3 Low temperatures (-10°C) – T3

For systems which are in use at low temperatures tests shall be performed at -10°C (see ETAG clause 5.1.7.2.1)

4.4 Moderate low temperature (0°C) – T4

For systems which are in use at moderate low temperatures tests shall be performed at 0°C (see ETAG clause 5.1.7.2.1)

4.5 Normal temperature (23°C) – T5

Tests are performed at least at normal temperature, 23°C, (see ETAG clause 5.1.7.2.1)

4.6 High temperature (40°C) – T6

For systems which are in use at high temperatures tests shall be performed at 40°C, (see ETAG clause 5.1.7.2.1).

5 Characteristics and related stress and test conditions

Table D1 is a matrix which gives an overview of the characteristics which may be tested under certain conditions. One line in the Table means one test under specified conditions of sample preparation (P), stress conditions (S) and performed at certain test temperatures (T)

Tests marked with 'M' are mandatory tests. They have to be done in any case independent of the Member State(s) in which the product will be marketed.

For tests marked with 'N', the NPD option is allowed. These tests shall be performed only if there is a requirement for that in the Member State(s) in which the kit will be marketed.

If tests are performed the test conditions marked with 'X' have to be considered.

Test conditions marked with 'O' are optional; one of the marked conditions shall be chosen by the manufacturer according to the requirements of the member state(s).

The fields shaded in grey relate to test conditions for which there are no requirements in any of the Member States and therefore are not covered by the ETAG.

Table D1 Test Matrix

Test conditions			Conditions for sample preparation (Pi)				Stress conditions before testing (Si)									Temperature conditions for testing (Ti)						
Test Categories			P1 NC	P2 SC	P3 MC	P4 OA	S0 -	S1.1 MA	S1.2 LM A	S1.3 CB M	S2 HA	S3 FT	S4 UV	S5.1 Wa	S5.2 AI	S5.3 Bi	T1 -30°	T2 -20°	T3 -10°	T4 0°	T5 23°	T6 40°
Test , ETAG reference to Chapter 5	M mandatory N not mandatory (Use category)	Speci men Type																				
Bond strength to support 5.1.1.1	M (A,B,C)	1	X				X														X	
	M (A, B, C)	1	X								X										X	
	M (A, B,C)	1		X			X														X	
	M(A)	1	X					O	O	O											X	
	N (A,B,C)	1	X				X											O	O			O
	N (A)	1	X								X										X	
	M (A,B,C)	1			X		X														X	
	M (A,B,C)	1				X	X														X	
Capacity to bridge cracks 5.1.1.2	M (A)	1/ 4/5b	X					O	O	O	X						O	O	O	O		
	M (B, C)	1	X									X					O	O	O	O		
Resistance to shear to support 5.1.1.7	M (A)	3/4/5b	X					O	O	O											X	
	N (A)	3/4/5b	X					O	O	O								O				O
	N (A)	3/4/5b	X					O	O	O		X									X	
Resistance to shear to overlay 5.1.4.2 ¹⁾	M (A)	5a	X					O													X	
	N (A)	5a	X					O			X										X	
Bond strength to	M (A)	3/4/5a	X					O	O	O											X	

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Test conditions			Conditions for sample preparation (Pi)				Stress conditions before testing (Si)									Temperature conditions for testing (Ti)							
Test Categories			P1 NC	P2 SC	P3 MC	P4 OA	S0 -	S1.1 MA	S1.2 LM A	S1.3 CB M	S2 HA	S3 FT	S4 UV	S5.1 Wa	S5.2 Al	S5.3 Bi	T1 -30°	T2 -20°	T3 -10°	T4 0°	T5 23°	T6 40°	
Test , ETAG reference to Chapter 5	M mandatory N not mandatory (Use category)	Speci men Type																					
overlay 5.1.4.1	N (A)	3/4/5a	X					O	O	O		X										X	
Water- tightness 5.1.1.8	M (A)	2	X				X															X	
	M (B,C)	2	X										X									X	
Resistance to Cl ⁻ penetration 5.1.1.3	N (A,B)	1	X				X															X	
Resistance to compaction 5.1.1.4.1	M (A)	2	X							X												X	
Slipperiness 5.1.4.3	M (B,C)	2	X				X															X	
Change of micro- hardness 5.1.7.1.2	M (A,B,C)	2	X											X								X	
	M (A,B,C)	2	X												X							X	
	M (A)	2	X													X						X	
Change of mass 5.1.7.1.2	M (A,B,C)	2	X												X								
	M (A,B,C)	2	X											X									
Change of tensile strength /	M (A)	2	X					O	O	O												X	
	M (A)	2	X								X											X	

Test conditions			Conditions for sample preparation (Pi)				Stress conditions before testing (Si)									Temperature conditions for testing (Ti)						
Test Categories			P1 NC	P2 SC	P3 MC	P4 OA	S0 -	S1.1 MA	S1.2 LM A	S1.3 CB M	S2 HA	S3 FT	S4 UV	S5.1 Wa	S5.2 AI	S5.3 Bi	T1 -30°	T2 -20°	T3 -10°	T4 0°	T5 23°	T6 40°
Test , ETAG reference to Chapter 5	M mandatory N not mandatory (Use category)	Specimen Type																				
elongation 5.1.1.5 5.1.7.1.3.1 5.1.7.1.4 5.1.7.2.1	M (B,C)	2	X										X								X	
Abrasion/ wear 5.1.7.1.5	M (B)	1	X				X														X	
Capacity to penetrate pores 5.1.7.2.2	N (A,B,C)	-	X				X													X ¹		
Resistance to flow 5.1.7.2.3	M (A,B,C)	-	X				X														X	

1) at lowest application temperature

Note: The fields shaded grey relate to test conditions for which there are no requirements in any of the Member States.

1) Explanation of key signs

(for detailed information see text of Annex D above and related clauses of the ETAG)

P	Categories for sample preparation, as short keys to characterise the kit
P1 = P1	Normal application condition at 23 C and 50% rel. humidity
P2 = P2	Severe application conditions for minimum and maximum temperatures and maximum rel. humidity given by the manufacturer
P3 = MC	High moisture content of the concrete base specimen
P4 = OA	Overlapping areas: day joints, section joints
S	Categories of stress conditions before testing
S0	No stress before testing
S1	Heat impact
S1.1 = MA	Application of mastic asphalt with maximum application temperature $\geq 220^{\circ}\text{C}$ up to 250°C , declared by the manufacturer
S1.2 = LMA	Application of mastic asphalt with minimum application temperature $< 200^{\circ}\text{C}$ - , declared by the manufacturer
S1.3 = RA₁₇₀	Application and compactation of coarse bituminous mixture with 170°C
S2 = HA	Heat ageing at 70°C
S3 = FT	Freeze-Thaw cycles
S4 = UV	Artificial weathering und water and UV
S5	Materials in contact
S5.1 = Wa	Water
S5.2 = Al	Alkali
S5.3 = Bi	Bitumen
T	Categories of temperature conditions for testing
T1 = -30°C	Extreme low temperature -30°C
T2 = -20°C	Severe low temperature -20°C
T3 = -10°C	Low temperature -10°C
T4 = 0°C	Moderate Low temperature 0°C
T5 = 23°C	Normal temperature 23°C
T6 = 40°C	High temperature 40°C

	Others
M	The NPD option not allowed
N	The NPD-option is allowed
X	The X-marked conditions shall be considered
O	The O-marked conditions are optional, one of the marked conditions shall be chosen by the manufacturer
A, B, C	Use categories acc to ETAG 2.2.2 A - With overlay and intended to receive vehicular traffic B - Without overlay (exposed) and intended to receive only pedestrian or cyclist traffic C - Without overlay (exposed) and untrafficked (including special case of unballasted rail bridges).
1 ...5	Specimen Types according to Anne E

ANNEX E

TEST METHOD FOR THE DETERMINATION OF THE BEHAVIOUR OF LIQUID APPLIED BRIDGE DECK WATERPROOFING KITS APPLIED ON A VERTICAL SURFACE

1 SCOPE

This annex describes a test method for the determination of the behaviour of a liquid-applied bridge deck waterproofing kit when applied on vertical surfaces. The test is carried out on dry support.

Note: For systems where the manufacturer can demonstrate the satisfactory application of the kit to a vertical surface i.e. without slumping or sagging evident, then this test shall not be required.

2 NORMATIVE REFERENCES

No normative references

3 TEST METHOD

3.1 PRINCIPLE

This test consists of quickly applying the component(s) of the kit to be tested to the horizontal face of a concrete support specimen and then quickly raising it into a vertical position. The ability of the product to resist flow, sagging etc is assessed by measuring the quantity of product which flows below the bottom of the vertical face at the end of a given period of time starting from the end of the application.

3.2 APPARATUS AND MATERIALS

- Climatic chamber with temperature and relative humidity regulated
- Equipment for preparation of the product in accordance with the manufacturer instructions;
- Product to be tested applied in accordance with the manufacturer's instructions
- Flexible brush
- Two base specimens in concrete of dimensions 40 x 300 x 300 mm
- Suitable balance with an accuracy of 0.1 g
- Plastic film or aluminium foil.
- Sharp knife for trimming the specimen

3.3 PROCEDURE

3.3.1 Conditioning of the support specimens and application of the primer

The concrete support specimens shall be maintained for 7 days in a climatic chamber at a temperature of $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity.

If a primer is required to be applied, the concrete supports shall be dusted with a suitable flexible brush just before the application of the primer.

The application of the primer shall be carried out under the application conditions and using a coverage rate declared by the manufacturer.

The manufacturer shall also specify:

- the drying time for the primer (if it is a primer with solvents)
- the time of polymerisation for thermosetting products

After application of the primer, the specimens shall be protected from dust and any other pollutants and stored at $(23 \pm 2)^\circ\text{C}$.

3.3.2 Preparation of the samples.

The components of the waterproofing product shall be conditioned in a climatic chamber maintained at $(23 \pm 2)^\circ\text{C}$ for at least 24 hours before the application.

The preparation and the application of the waterproofing product shall be carried out in accordance with the instructions of the manufacturer e.g. mix proportions for multi-component products, and cure time.

All weighing of components and mixed product shall be carried out with a tolerance of ± 0.1 g.

The application of the product and the subsequent storage of the test specimens during the test shall be at $(23 \pm 2)^\circ\text{C}$.

3.3.3 Application of the waterproofing product.

Prepare the quantity of product sufficient for the test according to the instructions of the manufacturer. Precisely weigh the quantity of product prepared and the tools for application which will be used: M.

Apply the product carefully and as soon as possible to the primed (if applicable) support specimen without overflowing over the edges until it is perfectly covered with product. Note the time to the end of this operation.

Immediately raise the coated specimen (specimen A) into the vertical position and suspend it in such a way that the coated face is steady and over a pre-weighed aluminium or plastic sheet (mass M_{1A}). The specimen shall be allowed to stand without interference for a period of (24 ± 2) hours

Determine the quantity of product applied to the support specimen: $M_1 = M - M'$, in grams, by precisely weighing the remaining quantity of product and the tools following the application: M' .

Repeat the above for the second support specimen (specimen B). Note the masses M_{1B} and M_2 .

At the end of (24 ± 2) hours, any material hanging over the bottom edge of the specimen shall be cut using a sharp knife and weighed along with any material that has fallen onto the pre-weighed aluminium or plastic sheet. M_{2A} for the first specimen and M_{2B} for the second.

4 EXPRESSION OF RESULTS

The results are presented as follows:

- mass in grams of the losses by falling off for sample A: $M_A = M_{2A} - M_{1A}$
- mass in grams of the losses by falling off for sample B: $M_B = M_{2B} - M_{1B}$

Where

M_{1A} and M_{1B} are the mass of aluminium or plastic sheet,
 M_{2A} and M_{2B} are the mass of aluminium or plastic sheet including material fallen and/or cut off.

- percentage of losses for sample A: $P_A = M_A / M1 \times 100$
- percentage of losses for sample B: $P_B = M_B / M2 \times 100$

Where:

M1 and M2 are the differences between the mass M of initial quantity of prepared product + the mass of tools before use and the mass M' of product remaining in the pots and on the tools after use.

The mean loss for the two samples is expressed as a percentage using the following equation:

$$P = (P_A + P_B)/2$$

5 TEST REPORT

The test report shall include at least the following information:

- a) all details necessary to identify the product tested and identification of the whole waterproofing system and application temperature, type and quantity of the primer;
- b) a reference to this annex and any deviation from it;
- c) information on preparation of test specimens and prepared by and witnessed by which organization;
- d) the dates of delivery of sample and preparation of test specimens;
- e) the test result;
- f) the date of tests.

6 BIBLIOGRAPHY

- EN 13062:2003 Products and systems for the protection and repair of concrete structure Test method - Determination of thixotropy of products for protection of reinforcement

ANNEX F

LIST OF STANDARDS REFERRED IN ETAG LABDWK

Standards	§	Title
EN 1991-1-5 cl. 6.1	2.3.2	Actions on structures - Part 1-5: General actions - Thermal actions
EN 1766: 2000 clause 7.2.	2.3.3	Products and systems for the protection and repair of concrete structures - Test methods - Reference concretes for testing
EN 13036-1: 2002	2.3.3	Road and airfield surface characteristics - Test methods - Part 1: measurements of pavement surface macrotexture depth using a volumetric patch technique
EN 13596: 2004	5.1.1.1 5.1.4.1	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Determination of bond strength
EN ISO 4624: 2003	5.1.1.1 5.1.4.1	Paints and varnishes - Pull-off test for adhesion
EN 13375: 2004	5.1.1.4.1 An B An E	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Specimen preparation
prEN 14224: 2009	5.1.1.2	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Determination of crack bridging ability
TR 022: 2007	5.1.1.3	Determination of the resistance to the passage of chloride ions through a waterproofing layer subjected to indentation by aggregate. (February 2007)
EN 14692: 2005	5.1.1.4.1	Flexible sheets for waterproofing — Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles — Determination of the resistance to compaction of an asphalt layer
EN 12697-33: 2003	5.1.1.4.1	Bituminous mixtures - Test methods for hot mix asphalt - Part 33 : specimen prepared by roller compactor
EN ISO 527-2: 1996	5.1.1.5 i c 5.1.7.1.3.1 5.1.7.1.4	Plastics – Determination of tensile properties – Part 2: test conditions for moulding and extrusion plastics.
EOTA TR 006: 2004	5.1.1.6	Determination of the resistance to dynamic indentation (May 2004)
EN 13653: 2004	5.1.1.7 5.1.4.2	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Determination of shear strength
EN 14694: 2005	5.1.1.8	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Determination of resistance to dynamic water pressure after damage by pre-treatment
EN 13036-4: 2003	5.1.4.3	Road and airfield surface characteristics - Test methods - Part 4: Method for measurement of slip/skid resistance of a surface - The pendulum test
EN 14223: 2005	5.1.7.1.2.1	Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles – water absorption
ISO 48: 2007	5.1.7.1.2.1 5.1.7.1.2.2 5.1.7.1.2.4	Rubber, vulcanized or thermoplastic - Determination of hardness between 10 and 35 IRHD.
EN ISO 175: 2001	5.1.7.1.2.2	Plastics – Methods of test for the determination of the effect of immersion in liquid chemicals.
TR 011: 2004	5.1.7.1.3.1	Exposure procedure for accelerated ageing by heat. Edition May 2004
EN 13687-3: 2002	5.1.7.1.3.2	Products and systems for the protection and repair of concrete structures - Test methods - Determination of thermal compatibility - Part 3: Thermal cycling without de-icing salt impact
TR 010: 2004	5.1.7.1.4	Exposure procedure for artificial weathering.
DD ENV 12633: 2003	5.1.7.1.5	Method of determination of unpolished and polished slip / skid resistance value.
EN ISO 3219: 1995	5.1.7.2.2	Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate

EN 13578	5.1.7.2.6.1	Products and systems for the protection and repair of concrete structure - Test Method - Compatibility on wet concrete
EN 1297	5.1.7.2.6.3	Flexible sheet for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Method of artificial ageing by long term exposure to the combination of UV radiation, elevated temperature and water.
EN ISO 9001	8.2.1.2	Quality management systems - Fundamentals and vocabulary (ISO 9001:2000)
EN ISO 2808	B.6.2	Paints and varnishes. Determination of film thickness.
EN 13062 -2003	ANNEX E Bibliography	Products and systems for the protection and repair of concrete structure Test method - Determination of thixotropy of products for protection of reinforcement.

Note : Standards referenced under the Tables of clause 5.2 are not included in this list