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ETAG 035

GUIDELINE FOR
EUROPEAN TECHNICAL APPROVAL
of

ULTRA THIN LAYER ASPHALT CONCRETE

Version April 2011

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Section one

INTRODUCTION

1. PRELIMINARIES

1.1. Legal basis written by the EOTA secretary general

Common clause (variable)

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 : 16/12/2005
- the final mandate issued by the EFTA : 16/12/2005
- adoption of the GUIDELINE by the Executive Commission of EOTA: 19/07/2008
- opinion of the Standing Committee for Construction : 25/09/2009
- 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No existing ETA GUIDELINE is superseded.

1.2. Status of ETAG

Common clause (fixed)

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 *Ultra Thin Layer Asphalt Concrete (UTLAC)* is fit for its intended use, i.e. they enable works in which it is 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 ETA GUIDELINE is a basis for ETAs, i.e. a basis for technical assessment of the fitness for use of an UTLAC for an intended use. An ETA GUIDELINE is not itself a technical specification in the sense of the CPD.

This ETA GUIDELINE expresses the common understanding of the APPROVAL BODIES, acting together within EOTA, as to the provisions of the EC-Construction Products Directive 89/106 and of the Interpretative Documents, in relation to the Ultra Thin Layer Asphalt Concrete and uses concerned, and is written within the framework of a mandate given by the Commission and the EFTA Secretariat, after consulting the EC-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 the *Ultra Thin Layer Asphalt Concrete* 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 an UTLAC 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, *Ultra Thin Layer Asphalt Concrete* which is 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 art permits and after having been confirmed as appropriate for the particular product by the ETA.

2. SCOPE

2.1. Scope

This GUIDELINE covers *Ultra Thin Layer Asphalt Concrete: UTLAC*.

UTLAC is a proprietary hot mix asphalt road surface course laid on a bonding layer, at a nominal thickness between 10 and 20 mm with properties suitable for the intended use. The method of bonding is an essential part of the process. The grading curve of the bituminous mixture is generally gap graded and the upper sieve size of the mix is not less than 5 mm and not greater than 11 mm.

NOTE: The designation of the upper sieve size *D* of the bituminous mixture for UTLAC accepts the presence of some particles which are retained on the sieve *D* within 90 % and 99 % in mass and 0 % on the sieve 1,4 x *D*.

Relationship with European harmonized standards

Other types of bituminous mixtures are included in standard series EN 13108
Bituminous mixtures for UTLAC will be specified in this series by prEN 13108-9

2.2. Product families/ Kits and Systems/ Use categories/

2.2.1 Families, Levels and classes

- Regulatory classes for reaction to fire, no regulatory levels.
- One family type.

2.2.2 Kits and systems

UTLAC is a product with 2 components: a bituminous mixture and a bonding system.

2.2.3 Use categories

One category for road application.

2.3. Assumptions

Common clause:

The state of the Art doesn't 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 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 subject to consensus within EOTA. Experience in this respect is collected, after endorsement in EOTA-TB, in the ETAG-Format-Comprehension document.

3. TERMINOLOGY and NORMATIVES REFERENCES

3.1. Common terminology and abbreviations (see ANNEX A)

3.2. Terminology and abbreviations specific to this ETAG

3.2.1 *ETA Holder* : UTLAC manufacturer or their representatives

3.2.2 *Factory* : where the bituminous mixture is laid on the bonding system,

3.2.3 *Gap graded curve* : sieve size distribution, where an intermediate fraction is missing (e.g. UTLAC 0/6 2/4 gap-graded)

3.2.4 *Initial skid resistance* : skid resistance measured on the UTLAC less than three months after installation

3.2.5 *Initial texture* : macro-texture measured on the UTLAC less than three months after installation,

3.2.6 *Manufacturer* : The UTLAC manufacturer is the person who takes responsibility for the final product when the bituminous mixture is laid on the bonding system.

3.2.7 *Nominal thickness* : average design thickness of the layer;

3.2.8 *Retained skid resistance* : skid resistance measured on UTLAC after an agreed period of traffic, e.g. 1 or 2 years,

3.2.9 *Retained texture* : macro-texture measured on UTLAC after an agreed period of traffic, e.g. 1 or 2 years,

3.2.10 *Trial section* : trafficked road section on which the performances are assessed,

3.2.11 *UTLAC* : Ultra Thin Layer Asphalt Concrete.

3.3. Normative references

EN 13043, *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.*

EN 13108-1, *Bituminous mixtures - Material specifications - Part 1 : asphalt concrete.*

EN 13108-2, *Bituminous mixtures - Material specifications - Part 2 : asphalt concrete for very thin layers.*

EN 13108-3, *Bituminous mixtures - Material specification - Part 3 : soft asphalt.*

EN 13108-4, *Bituminous mixtures - Material specifications - Part 4 : hot rolled asphalt.*

EN 13108-5, *Bituminous mixtures - Material specifications - Part 5 : stone mastic asphalt.*

EN 13108-6, *Bituminous mixtures - Material specifications - Part 6 : mastic asphalt*

EN 13108-7, *Bituminous mixtures - Material specifications - Part 7 : porous asphalt.*

EN 13108-8, *Bituminous mixtures - Material specifications - Part 8 : reclaimed asphalt.*

prEN 13108-9, *Bituminous mixtures - Material specifications - Part 9 : Bituminous mixture for Ultra-thin layer Asphalt Concrete (UTLAC)*

EN 12591, *Bitumen and bituminous binders - Specifications for paving grade bitumens.*

EN 14023, *Bitumen and bituminous binders - Framework specification for polymer modified bitumens.*

EN 12697-1, *Bituminous mixtures - Test methods for mix asphalt - Part 1 : soluble binder content.*

EN 12697-2, *Bituminous mixtures - Test method for hot mix asphalt - Part 2 : Determination of particle size distribution.*

EN 12697-12, *Bituminous mixtures - Test methods for hot mix asphalt - Part 12 : determination of the water sensitivity of bituminous specimens.*

EN 12697-16, *Bituminous mixtures - test methods for hot mix asphalt - Part 16 : abrasion by studded tyres.*

EN 933-1, *ests for geometrical properties of aggregates. Part 1 : determination of particle size distribution. Sieving method.*

EN 13501-1, *Fire classification of construction products and building elements - Part 1 : classification using data from reaction to fire tests.*

EN 12272-1, *Surface dressing - Test methods - Part 1 : rate of spread and accuracy of spread of binders and chippings.*

EN 12274-6, *Slurry surfacing - Test method - Part 6 : rate of application.*

EN 12274-2, *Slurry surfacing - Test method - Part 2 : determination of residual binder content.*

EN 1367-1, *Tests for thermal and weathering properties of aggregates - Part 1 : determination of resistance to freezing and thawing.*

EN ISO 9001, *Quality management systems – Requirements.*

EN 13036-1, *Road and airfield surface characteristics - Test methods - Part 1 : measurement of pavement surface macrotexture depth using a volumetric patch technique.*

EN 1097-8, *Tests for mechanical and physical properties of aggregates - Part 8 : determination of the polished stone value.*

Section two

GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE

GENERAL NOTES

Common clause

(a) Applicability of the ETAG

This ETAG provides guidance on the assessment of *Ultra Thin Layer Asphalt Concrete* and their intended use. It is the manufacturer or producer who defines *the Ultra Thin Layer Asphalt Concrete* for which he is seeking ETA and how it is to be used in the works, and consequently the scale of the assessment.

It is therefore possible that for some products, which are fairly conventional, only some of the tests and corresponding criteria are sufficient to establish fitness for use. In other cases, e.g. special or innovative product or materials, or where there is a range of uses, the whole package of tests and assessment may be applicable.

(b) General lay out of this section

The assessment of the fitness of *Ultra Thin Layer Asphalt Concrete* with regard to their fitness for intended use in construction works is a process with three main steps and a chapter with recommendations:

- Chapter 4 clarifies **the specific requirements for the works** relevant to the *Ultra Thin Layer Asphalt Concrete* and uses concerned, beginning with the ESSENTIAL REQUIREMENTS for works (CPD art. 11.2) and then listing the corresponding relevant characteristics of *Ultra Thin Layer Asphalt Concrete*.
- Chapter 5 extends the list in chapter 4 into more precise definitions and 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 proof, etc. (selection of the appropriate methods)
- Chapter 6 provides guidance on **the assessing and judging methods** to confirm fitness for the intended use of *Ultra Thin Layer Asphalt Concrete*.
- Chapter 7, **assumptions and recommendations** are only relevant in as far as they concern the basis upon which the assessment of the *Ultra Thin Layer Asphalt Concrete* 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)

According to the CPD, in this ETAG, "Classes" refer only to mandatory levels or classes.

This ETAG indicates the compulsory way of expressing relevant performance characteristics for the *Ultra Thin Layer Asphalt Concrete*. 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 of, in which case the ETA will state "no performance determined" against that aspect, except for those properties for which, when no determination has been made, *the Ultra Thin Layer Asphalt Concrete* doesn't 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 ETA GUIDELINE or referred to, have been written based upon the assumed intended working life of the *Ultra Thin Layer Asphalt Concrete* for the intended use of 7 years, provided that the *Ultra Thin Layer Asphalt Concrete* is 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 an *Ultra Thin Layer Asphalt Concrete* cannot be interpreted as a guarantee given by the producer or the APPROVAL BODY. They should only be regarded as a means for the specifiers to choose the appropriate criteria for *Ultra Thin Layer Asphalt Concrete* 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, the *Ultra Thin Layer Asphalt Concrete* 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, see CPD ANNEX I, preamble.

4 REQUIREMENTS

common clause

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 (UTLAC and intended uses), and providing a list of relevant product characteristics.

When a product characteristic or other applicable property is specific to one of the Essential Requirements, it is dealt with in the appropriate place. If, however, the characteristic or property is relevant to more than one Essential Requirement, it is addressed under the most important one with cross-reference to the other(s). This is especially important where a manufacturer claims "No performance determined" for a characteristic or property under one Essential Requirement and it is critical for the assessing and judging under another Essential Requirement. Similarly, characteristics or properties which have a bearing on durability assessments may be dealt with under ER 1 to ER 6, with reference under 4.7. Where there is a characteristic which only relates to durability, this is dealt with in 4.7.

Table 4.0 Comprehensive table

ER	Corresponding ID Paragraph for works	Corresponding ID paragraph for product performance	Product performance characteristic from mandate	ETAG paragraphs on product performance
1	2.1.2 Loadings that are liable to act on the works	3.2 (1 and 2) Permanent and Variable actions	Resistance to permanent deformation Resistance to studded tyres Bond to substrate	4.1 Mechanical resistance and stability 4.1.3 Resistance to rutting: <u>not relevant due to the thinness of the layer</u> 4.1.4 Resistance to studded tyres 4.1.1 Bond to substrate
		3.3 (4) Verification of the satisfaction of the Essential Requirement		4.3 Provisions concerning products (ID 1 Appendix 5 c 'Other Products')
2	4.3. Provisions concerning products	4.3.1.1 products subject to reaction to fire requirements	Reaction to fire	4.2 Safety in case of fire
3	3.3.5 Outdoor environment	3.3.5.2 Control of the impact of construction works on the outdoor environment ANNEX V 'Outdoor Environment' 5.0 Working life, durability	Dangerous substances	4.3 Hygiene Health and environment
4	3.3.6 Accidents resulting from vehicle movement	3.3.6.3 Relevant characteristics of the product		4.4. Safety in use
			Skid resistance	4.4.1. Skid resistance

ER	Corresponding ID Paragraph for works	Corresponding ID paragraph for product performance	Product performance characteristic from mandate	ETAG paragraphs on product performance
		5.0 Working life, durability	Texture	4.4.2 Texture 4.4.3 Aspect of durability
5	2.3.6 Protection of the environment against the noise produced by sources inside or associated with works	4.3.2.2 Acoustic properties of products used in the civil engineering field 5.0 Working life, durability	Noise absorption	4.5 Protection against noise
6	Not relevant			4.6 Energy economy and heat retention
Durability			Freeze thaw resistance	4.7 Aspects of durability, serviceability and identification of the products as far as necessary for the satisfaction of the CPD not covered by the ER1 – 6. 4.7.1 Aspects of durability 4.7.2 Aspects of serviceability 4.7.3 aspects of identification

4.1 Mechanical resistance and stability

UTLAC shall be capable of withstanding permanent and variable actions liable on the works to which the UTLAC is a part in terms of the following:

4.1.1 Bond to substrate

To allow the integrity of UTLAC to be maintained for a reasonable working life UTLAC shall show satisfactory torque and tensile bond to the substrate.

4.1.2 Sensitivity to water

To allow the integrity of UTLAC to be maintained for a reasonable working life UTLAC shall have sufficient resistance to the effects of weathering in particular sufficient resistance to the effects of water.

4.1.3 Resistance to rutting

Due to the thinness of the layer, the risk of permanent deformation in the mixture is non-existent. Permanent deformation may occur because of the substrate characteristics. Rutting resistance is considered as non relevant for UTLAC.

4.1.4 Resistance to studded tyres

To allow the integrity of UTLAC to be maintained for a reasonable working life UTLAC shall have sufficient resistance to the abrasion by the studded tyres.

4.1.5 Sealing

This characteristic is the ability to reduce the passage of water into the substrate by means of adequate void content. The void content in situ cannot be assessed in the case of UTLAC and this characteristic is considered as non-relevant.

4.2 Safety in case of fire

According to National or Regional regulation of the MEMBER STATES, using the Euroclasses.

4.3 Hygiene, health and environment

UTLAC shall 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 contain or cause harmful emission of toxic gases, dangerous particles or radiation to the indoor environment nor contamination of the outdoor environment (air, soil or water).

4.4 Safety in use

4.4.1 Skid resistance

UTLAC shall be designed to provide a surface course with satisfactory slip / skid resistance.

4.4.2 Texture

An UTLAC shall be designed to achieve a texture depth that can provide a satisfactory macro-textured surface course to provide a satisfactory skid resistance.

4.4.3 Durability

An UTLAC shall be designed to ensure the satisfactory retention of skid resistance.

- 4.4.3.1 Retained skid resistance
- 4.4.3.2 Retained texture
- 4.4.3.3 Polished Stone Value

4.5 Protection against noise

UTLAC shall provide a driving surface that can give adequate protection to the environment from noise produced by minimising the traffic noise caused by the interaction of tyres with the road surface.

4.6 Energy economy and heat retention

Not relevant

4.7 Aspects of durability, serviceability and identification of the product as far as necessary for the satisfaction of the CPD not covered by the § 4.1 to 4.6

The requirements considered in the following are those which are related to the ESSENTIAL REQUIREMENTS, but not to any one in particular. As a consequence, failure to meet these requirements means that one or more of the ESSENTIALS REQUIREMENTS can no longer be met over time.

4.7.1 Aspects of durability and serviceability

UTLAC shall have sufficient resistance to the effects of permanent or variable actions liable on the works to ensure that deterioration of materials and components does not significantly affect the performance of the surface course in relation to fulfilling all the ESSENTIAL REQUIREMENTS 1–5. Compliance with the ESSENTIAL REQUIREMENTS will require that, during the intended use, a satisfactory skid resistance and texture depth can be maintained throughout the working life of the product.

The following aspect of serviceability necessary for the satisfaction of the CPD, and not covered by Sections 4.1 to 4.6, shall be taken into account:

- The effects of the quality of the substrate (e.g. surface texture, cracks, deformations or deflections)
- The effects of site location and weather conditions during installation, etc

4.7.2 Aspects of Identification

The materials used in UTLAC shall be identifiable to the extent that their properties might influence the ability to fulfil 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”.

Components of the UTLAC which have been evaluated according to appropriate European Standards, and which have the characteristics required for use in an UTLAC, do not need re-testing for the purposes of assessment for an ETA.

For the purposes of testing/assessment, UTLACs or components may be grouped into ranges, where it is considered that, for any characteristic, the results of testing any one product or component are representative for all other products or components within that range.

NOTE : Products/components may be in different ranges for different characteristics.

5.0 Table adding verification methods to tables 4.0

ER	Corresponding ID paragraph for product performance	Product performance characteristic from mandate	ETAG paragraphs on product performance	ETAG paragraph on verification method
1	3.2 (2) Variable actions 3.3 (4) Verification of the satisfaction of the Essential Requirement 4.3 Provisions concerning products (ID 1 Appendix 5 c 'Other Products') 5.0 Working Life, durability	Resistance to rutting Resistance to studded tyres Bond to substrate Water sensitivity Sealing	4.1 Mechanical resistance and stability 4.1.3 Resistance to permanent deformation: <u>not relevant</u> 4.1.4 Resistance to studded tyres 4.1.1 Bond to substrate 4.1.2 Sensitivity to water 4.1.5 Ability to reduce the passage of water by a low void content : Not relevant	5.1 Verification methods related to mechanical resistance and stability 5.1.3 Resistance to studded tyres 5.1.1 Bond to substrate 5.1.1.1 Torque bond strength 5.1.1.2 Tensile strength 5.1.2 Sensitivity to water
2	4.3.1.1 Products subject to reaction to fire requirements	Reaction to fire	4.2 Safety in case of fire	5.2 Verification methods related to safety in case of fire
3	3.3.5.2 Control of the impact of construction works on the outdoor environment ANNEX V 'Outdoor Environment' 5.0 Working life, durability	Dangerous substances	4.3 Hygiene Health and environment	5.3 Verification methods related to hygiene health and the environment 5.3.1 Release of dangerous substances 5.3.1.1 Presence of dangerous substances in the product 5.3.1.2 Compliance with the applicable regulations 5.3.1.3 Application of the precautionary principle
4	3.3.6.3 Relevant characteristics of the product 5.0 Working life, durability	Skid resistance Texture	4.4. Safety in use 4.4.1. Skid resistance 4.4.2 Texture 4.4.3 Aspect of durability	5.4 Verification methods related to safety in use 5.4.1 Initial Skid resistance 5.4.2 Initial Texture 5.4.3 Working life durability 5.4.3.1 Retained skid resistance 5.4.3.2 Retained texture depth 5.4.3.3 Polished Stone Value of aggregate

ER	Corresponding ID paragraph for product performance	Product performance characteristic from mandate	ETAG paragraphs on product performance	ETAG paragraph on verification method
5	4.3.2.2 Acoustic properties of products used in the civil engineering field 5.0 Working life, durability	Noise absorption	4.5 Protection against noise	5.5 Verification methods related to protection against noise 5.5.1 Acoustic properties
6	Not relevant			
Durability		Freeze thaw resistance	4.7.1 Aspects of durability and serviceability 4.7.3 Aspects of identification	5.7.1 Aspects of durability and serviceability 5.7.1 Performance trial 5.7.2 Aspects of identification of the mixture 5.7.2.1.1 Particle size distribution 5.7.2.1.2 Aggregate characteristics 5.7.2.1.3 Type of bitumen in the mixture 5.7.2.1.4 Bitumen content of the mixture 5.7.2.1.5 Additives (if relevant) 5.7.2.2 Aspect of identification of the bonding system 5.7.2.2.1 Type of bond coat 5.7.2.2.2 Rate of spread of bond coat

5.1 Verification methods related to mechanical resistance and stability

5.1.1 Bond to substrate

To establish the bond strength between the UTLAC and the substrate, the bond strength shall be determined by measuring the:

- 5.1.1.1 Torque bond strength, in accordance with the methods described in ANNEX D
- 5.1.1.2 Tensile strength, in accordance with the method described in ANNEX E.

NOTE: see detail of rate of spread noted within the method of statement, chapter 7.

5.1.2 Sensitivity to water

The ability of UTLAC to resist the ageing affects of water in terms of retained strength after water conditioning shall be measured in accordance with:

EN 12697-12 *Bituminous mixtures. Test methods for hot mix asphalt. Determination of the water sensitivity of bituminous specimens.*

5.1.3 Resistance to studded tyres

The ability of UTLAC to resist the abrasion due to studded tyres shall be measured in accordance with:

EN 12697-16 *Bituminous mixtures. Test methods for hot mix asphalt. Abrasion by studded tyres.*

5.2 Verification methods related to Safety in case of fire

If the manufacturer declares a Euroclass of Class Efl or higher for reaction to fire, (i.e. it is subject to regulatory requirements), the UTLAC shall be tested as a floor covering and classified in accordance with EN 13501-1.

5.3 Verification methods related to hygiene health and the environment

As expressed by the national provisions of MEMBER STATES in particular with regard to harmful emission of toxic gases or contamination of the outdoor environment (air, soil or water).

5.3.1 Release of dangerous substances

5.3.1.1 Presence of dangerous substances in the product

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

5.3.1.2 Compliance with the applicable regulations

If the product 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 EU data-base (method(s) of content or release, as appropriate).

5.3.1.3 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.

5.4 Verification methods related to Safety in use

5.4.1 Initial Skid resistance

The skid resistance of the surface shall be measured in accordance with: the test method accepted in the MEMBER STATE of destination until CEN has harmonized test methods.

5.4.2 Initial Texture

The macro-texture depth of the UTLAC surface shall be measured in accordance with: EN 13036-1 Road and airfield surface characteristics. Test methods. Measurement of pavement surface macro-texture depth using a volumetric patch technique.

5.4.3 Aspects of durability

5.4.3.1 Retained skid resistance

The test methods for skid resistance is given in 5.4.1. The retained measurement shall be determined after a minimum of 1 year.

5.4.3.2 Retained Texture depth

The test methods for texture depth is given in 5.4.2.
The retained measurement shall be determined after a minimum of 1 year.

In order that UTLAC will fulfil its intended use, subject to normal maintenance, the suitability of the construction works in terms of the quality of the substrate (e.g. surface texture, cracks, deformations, deflections etc), and the effects of site location and weather conditions during installation on the serviceability of UTLAC shall be considered under requirements for installation stated in Chapter 7.

An installation trial shall be carried out and witnessed to ensure that the method of installation is both practicable and sufficiently detailed to cover all the eventualities listed above. **The trial shall be at least one year in use until ANNEX B is completed.**

5.4.3.3 Polished Stone Value

The polished stone value of the aggregates of the bituminous mixture shall be measured according to EN 1097-8: Tests for mechanical and physical properties of aggregates - Part 8 : determination of the polished stone value

5.5 Verification methods related to Protection against noise(Acoustic properties)

Acoustic properties

Nature of UTLAC, gap-graded mixture, using aggregates with a maximum upper sieve size $D = 11$ mm makes a “quiet” surface course when compared with other surface courses. These characteristics make the UTLAC unnecessary to be tested.

5.6 Verification methods related to Energy economy and heat retention

Not relevant

5.7 Verification methods related to Aspects of durability, serviceability and identification of the product not covered by ER1-5

5.7.1 Aspects of durability and serviceability

A visual assessment of a trial site will be undertaken to determine the ability of the UTLAC to show satisfactory resistance to the effects of permanent and variable actions to insure that deterioration of materials and components during the intended working life do not significantly affect the performance of the surface course.

The visual assessment shall be carried out in accordance with ANNEX B and C: Procedure for performance trial and visual assessment.

For a more complete assessment of durability, changes in the surface macro and micro-texture of the product shall be measured after exposure to expected conditions over a fixed period of time during the product's intended use.

5.7.2 Aspects of Identification

All constituent materials shall be clearly stated and identified. Wherever possible references to harmonised European standards shall be made. The specifications for the constituents should provide maximum flexibility to choose alternative products without affecting the declared performances or the

fitness for intended use. If this is not possible, the materials shall be specified by their brand name, type, class etc, and the manufacturer identified.

It is essential that for an UTLAC to be identified as fit for purpose the above information must be provided to identify the following constituents:

5.7.2.1 Aspects of identification of the mixture.

5.7.2.1.1 Particle size distribution (EN 12697-2 and EN 933-1) (including upper sieve size of the mixture)

Change in the upper sieve size (6 mm; 8 mm, 10 mm or 5,6 mm; 8 mm; 11 mm), in the grading curve type (continuous, gap-graded) makes the product considered as different.

5.7.2.1.2 Aggregate characteristics (EN 13043), and, if relevant the freeze thaw resistance according to EN 1367-1

Change in the category of coarse aggregate, as defined in EN 13043, for one of the following properties: shape, percentage of semi-crushed aggregate, resistance to fragmentation, resistance to wear, change in the source, the grading category or, where appropriate, the angularity category of fine aggregate makes the product considered as different.

5.7.2.1.3 Type of bitumen in the mixture (according to EN 12591 or EN 14023 or alternative hydrocarbon binders to be considered)

Change in grade as defined in EN 12591 or EN 14023 makes the product considered as different.

5.7.2.1.4 Added binder or binder content in the mixture (EN 12697-1)

5.7.2.1.5 Additives (if relevant)

The characteristics of additives at least able to be identified by organoleptic tests.

5.7.2.2 Aspect of identification of the bonding system:

5.7.2.2.1 Nature and type of bond coat

5.7.2.2.2 Rate of spread of bond coat EN 12272-1 (surface dressing) or EN 12274-6 (slurry surfacing) or EN 12274-2 (residual binder)

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

This chapter details the performance requirements 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).

Table 6.0 Table linking ESSENTIAL REQUIREMENTS to product requirements

ER	ETAG paragraphs on product performance	Type of performance declaration in ETA Category / class / numeric value	
1	6.1.1 Bond to substrate		
	6.1.1.1 Torque bond strength	Numeric value	NPD
	6.1.1.2 Direct tensile test	Numeric value	NPD
	6.1.2 Sensitivity to water	Numeric value	NPD
	6.1.3 Resistance to studded tyres	Numeric value	NPD
2	6.2 Reaction to fire	Euroclass	Class F _{fl}
3	6.3.1 Dangerous substances	Indication of harmful materials by declaration.	
4	6.4 Texture and skid resistance		
	6.4.1 Skid Resistance	Numeric value	NPD
	6.4.2 Texture	Numeric value	
	6.4.3 Working life, durability		
	6.4.3.1 Retained skid resistance	Numeric value	NPD
	6.4.3.2 Retained Texture depth	Numeric value	NPD
6.4.3.3 Polished stone value	Numeric value		
5	6.5 Acoustic properties		NPD
6	6.6 Energy economy and heat retention	No requirement	
D U R A B I L I T Y	6.7.1 Aspect of durability and Aspects of serviceability		
	6.7.2 Aspects of Identification	6.7.2.1 Mixture characteristics 6.7.2.1.1 Aggregates characteristics 6.7.2.1.2 Nature of grading curve 6.7.2.1.3 Type of bitumen in the mixture 6.7.2.1.4 Bitumen content of the mixture 6.7.2.1.5 Additives (if relevant) 6.7.2.2 Bonding system 6.7.2.2.1 Nature and type of bond coat 6.7.2.2.2 Rate of spread	

6.1 Assessing and judging the fitness for use, of the products related to the requirements for mechanical resistance and stability

6.1.1 Bond to substrate

6.1.1.1 Torque bond strength

Torque test: Numeric value or No Performance Determined

6.1.1.2 Direct tensile strength

Direct tensile test: Numeric value or No Performance Determined

6.1.2 Sensitivity to water

EN 12697-12: Numeric value or No Performance Determined

6.1.3 Resistance to studded tyres

EN 12697-16: Numeric value or No Performance Determined

6.2 Assessing and judging the fitness for use, of the products related to Safety in case of fire

The UTLAC shall be tested and classified in accordance with EN 13501-1 or to class F_{fl} declared.

6.3 Assessing and judging the fitness for use, of the products related to hygiene health and the environment

6.3.1 Release of Dangerous substances

The UTLAC shall comply with all relevant European and National provisions applicable for the uses for which the product is brought to the market. The attention of the applicant should be drawn to the fact that, for different uses or different MEMBER STATES of destination, there may be different requirements which would have to be respected.

6.4 Assessing and judging the fitness for use, of the products related to Safety in use

6.4.1 Initial Skid resistance

Numeric values of National test methods or No Performance Determined.

6.4.2 Initial Texture

Numeric value with the following condition: 90% of the measured values are greater than or equal to:

- 0,6 mm for UTLAC 0/5,6 and UTLAC 0/6
- 0,7 mm for UTLAC 0/8
- 0,8 mm for UTLAC 0/10 and UTLAC 0/11

6.4.3 Working life, durability

6.4.3.1 Retained skid resistance

Numeric value of national test methods or No Performance Determined

6.4.3.2 Retained texture depth

Numeric value or No Performance Determined

6.4.3.3 Polished stone value

Numeric value

Polished stone value of coarse aggregate shall be greater or equal to 50

6.5 Assessing and judging the fitness for use, of the products related to protection against noise

If composition of UTLAC is respected, all UTLACS are “quiet” surfaces.

6.6 Assessing and judging the fitness for use, of the products related to Energy economy and heat retention

Not relevant

6.7 Assessing and judging the fitness for use, of the products related to Aspects of durability, serviceability and identification of the product not covered by ER1-6

6.7.1 Aspects of durability and serviceability

Results of the visual assessment method of ANNEX B and ANNEX C shall be less than 10% for the sum of defect

6.7.2 Aspects of Identification

Manufacturer declared values for the following constituents:

6.7.2.1 Bituminous mixture

- 6.7.2.1.1 Aggregate characteristics
- 6.7.2.1.2 Nature of grading curve (including particle size distribution)
- 6.7.2.1.3 Type of bitumen in the mixture
- 6.7.2.1.4 Bitumen content of the mixture
- 6.7.2.1.5 Additives (if relevant)

6.7.2.2 Bonding system:

- 6.7.2.2.1 Nature and type of bond coat
- 6.7.2.2.2 Rate of spread of bond coat (surface dressing or residual binder)

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

Common clause

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).

Because the manufacturer of the UTLAC is responsible for the incorporation into the works, then the UTLAC is deemed to satisfy the 'ESSENTIAL REQUIREMENTS' when the installed product is assessed and declared 'fit for use' (see Chapter 6) as an assembled system within the works. It shall be assumed that the design rules, specified by the manufacturer, are fulfilled.

7.1 Design, installation and execution of systems of UTLAC into the works

7.1.1 Design

The works into which the UTLAC is to be installed should be structurally sound and of adequate strength to support the equipment used during the laying operation and to support the UTLAC layer and any permanent and variable actions expected by trafficking during the intended working life of the UTLAC.

7.1.2 Installation

The installation and composition of the UTLAC System should be as stated in the Manufacturer's technical literature and procedures for laying and compaction. The literature should include reference to the following aspects of installation. These should be read as minimum considerations appropriate

for hand and machine applied asphalt concrete. Any special equipment or techniques should also be detailed whenever specified by the manufacturer.

7.1.2.1 Preparation of the Road Surface

The manufacturer's procedures should include reference to the following:

- Inspection criteria to judge the suitability of the road surface to which the UTLAC is to be laid. This should include, but not be limited to, a pre-installation survey which should include an inspection of the site to take into account the overall condition of the surface and a record of any defects and recommendations for remedial work prior to the application of the product.
- There should be a clear statement on surface cleanliness, in particular whether the surface should be free from ice, standing water, loose materials and foreign matter.

7.1.2.2 Weather Conditions

The manufacturer's procedures should include recommendations for limiting weather conditions. Minimum air and surface temperature in conjunction with the wind speed for the laying of the UTLAC system should be defined. Air, road surface temperatures and wind speed should be recorded at the start and, if the weather is variable, during the installation process.

Where applicable, methods for mitigation of weather conditions should also be confirmed, e.g. laying season or heated screeds.

7.1.2.3 Traffic Management during installation

Traffic Management should be in accordance with national or local requirements

7.1.2.4 Bond coat

The bond coat is considered to be an integral part of the system. The manufacturer's procedures should include a reference to the following as a minimum:

- Type and identification of bond coat
- Rate and method of application

7.1.2.5 Bituminous mixture

The manufacturer's procedures should include a reference to the following as a minimum:

- Type and identification of bituminous mixture
- Minimum and maximum delivery temperature.

7.1.2.6 Laying and compaction of UTLAC

The manufacturer's laying procedure should detail the requirements for the paver used to lay the UTLAC. The information provided should detail what is expected of the paver to ensure that the UTLAC can be installed as per their requirements. Information should also be provided relating to the roller types and methods of compaction, minimum rolling temperature and information relating to time to trafficking. If specialised equipment is used then this should be detailed here.

7.1.2.7 Other information

The manufacturer's laying procedure should also include information relating to the following:

- Surface level tolerances for substrate and installed UTLAC
- Recommendations on type of substrates to which the UTLAC can be applied, e.g. concrete or bituminous.

- Preparation of ironwork
- Preparation of signal loops
- Preparation of joints.

7.2 Packaging, transport and storage

The manufacturer's laying procedure should include the necessary information to ensure that the hot mix asphalt and bond product are packaged, transported, and stored in such a way as to ensure that they are not degraded in any way prior to use. This will normally be in accordance with the supplier's recommendations. Below are typical examples of the type of information that should be available:

7.2.1 Bituminous mixture

- Permitted release agents for interior of haulage, tools and paver
- Type of haulage, e.g. insulated lorries with sheets or heated transport only
- Minimum and maximum delivery temperatures including mixing temperatures
- Maximum permitted timescale between mixing and laying of product
- Information that should be provided with each delivery, e.g. delivery ticket with reference numbers, mass of load delivered, product description
- Material safety data sheets

7.2.2 Bond coat

- Minimum and maximum storage temperatures
- Instructions on use, e.g. pre-mixing or heating
- Information that should be provided with each delivery, e.g. delivery ticket with reference numbers, mass of load delivered, product description
- Use by date
- Material safety data sheets

7.3 Maintenance and repair

The manufacturer should provide guidance relating to maintenance and repair of UTLAC, This should include references to suitable repair products and methods of repair and if applicable any required maintenance of the product when installed.

Section three

8. ATTESTATION AND EVALUATION OF CONFORMITY

8.1 EC decision

The system(s) of attestation of conformity specified by the European Commission in mandate CONSTRUCT 04/664, ANNEX 3 is system 2+ described in Council Directive (89/106/EEC) ANNEX III First possibility.

In addition, the system(s) of attestation of conformity given in Table 8.0 applies (apply) to UTLAC with regard to reaction to fire.

Table 8.0 - Choice of the system of attestation of conformity applicable to UTLAC with respect to reaction to fire

Product(s)	Intended use(s)	Level(s) or class(es) (<i>reaction to fire</i>)	Attestation conformity system(s)	of
<i>UTLAC</i>	for uses subject to regulations on reaction to fire	A1*, A2*, B*, C* A1**, A2**, B**, C**, D, E, (A1 to E) ***, F	1 3 4	
System 1: See Directive 89/106/EEC ANNEX III.2.(i), without audit-testing of samples System 3: See Directive 89/106/EEC ANNEX III.2.(ii), Second possibility System 4: See Directive 89/106/EEC ANNEX III.2.(ii), Third possibility * Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material) ** Products/materials not covered by footnote (*) *** Products/materials that do not require to be tested for reaction to fire (eg. Products/materials of class A1 according to Commission Decision 96/603/EC, as amended)				

8.1.1 System 1 Directive 89/106/CE, ANNEX III(2)(i), without audit-testing of samples

The system 1 for UTLAC is detailed as follow:

a) Tasks for the manufacturer

- Factory production control (See 8.2.2.1).

b) Tasks for the notified body

- Initial type-testing of the product.
- Initial inspection of factory and of factory production control.
- Continuous surveillance, assessment and approval of factory production control.

8.1.2 System 2+

The system 2+for UTLAC is detailed as follow:

(a) tasks for the manufacturer

- initial type testing of the product (See 8.2.2.1)
- Factory production control (See 8.2.1.1)

(b) tasks for the Notified Body

Certification of the factory production control on the basis of

- Initial inspection of the factory and of factory production control
- Continuous surveillance, assessment and approval of factory production control

8.2 Responsibilities

8.2.1 TASKS FOR THE MANUFACTURER

8.2.1.1 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. This production control system shall ensure that the product is in conformity with the EUROPEAN TECHNICAL APPROVAL (ETA).

Components of the UTLAC which have been evaluated according to appropriate European Standards, and which have the characteristics required for use in an UTLAC, do not need re-testing for the purposes of assessment for an ETA.

For the purposes of testing/assessment, UTLACs or components may be grouped into ranges, where it is considered that, for any characteristic, the results of testing any one product or component are representative for all other products or components within that range.

Manufacturers having an FPC system which complies with EN ISO 9001: 2008 and which addresses the requirements of an ETA are recognised as satisfying the FPC requirements of the Directive.

8.2.1.2 Testing of samples

The tests shall only be carried out on either the hot mix asphalt, the bond system or the final product or samples which are representative of the final product. It should be noted that UTLAC comprises both a hot mix asphalt and a bond coat and is assembled on site. Testing of the finished product can only be carried out on the surface of the finished product or on cores taken from the final product.

No testing of materials which are already CE marked (or for which the supplier gives technical information) is needed, at least of the components themselves.

8.2.1.3 Declaration of Conformity (System 2+)

When all the criteria of the Conformity Attestation are satisfied the manufacturer shall make a Declaration of Conformity.

8.2.2 TASKS OF THE MANUFACTURER OR THE NOTIFIED BODY

8.2.2.1 Initial Type Testing

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 section 6 of this ETAG, as part of the ETA

issuing procedure. These tests should be used for the purposes of Initial Type Testing* EITHER (System 1)

NOTE : A laboratory should be recommended by the APPROVAL BODY.

This work should be validated by the approved body for Certificate of Conformity purposes.

OR (System 3)

This work should be validated by an Approved Laboratory for Declaration of Conformity purposes by the manufacturer.

OR (System 2 or 4)

This work should be taken over by the manufacturer for Declaration of Conformity purposes.

*In this respect APPROVAL BODIES shall be able to have open arrangements with relevant Approved Bodies to avoid duplication, respecting each others responsibilities

8.2.3 TASKS FOR THE NOTIFIED BODY

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

Assessment of the factory production control system is the responsibility of the Notified Body.

An assessment shall be carried out of each ETA-Holder system including at least a visit of a production unit to demonstrate that the factory production control is in conformity with the ETA and any subsidiary information. This assessment shall be based on an initial inspection of the factory *and where required for System 1 or 2 + second "possibly"*:

The factory for an UTLAC is the site of assembly of the product UTLAC, namely the hot mixed asphalt and the bonding system.

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

It is recommended that surveillance inspections be conducted once per year.

In case of multiple production units with the same management system, surveillance inspections shall be conducted to ensure, under the responsibility of the Notified Body, sufficient controls are in place.

8.2.3.2 Certification of Factory Production Control

The Notified Body shall issue Certification of Factory Production Control

8.3 Documentation

In order to help the Notified Body make an evaluation of conformity the APPROVAL BODY issuing the ETA shall supply the information detailed below. This information together with the requirements given in EC Guidance Paper B will generally form the basis on which the factory production control (FPC) is assessed by the Notified Body

This information shall initially be prepared or collected by the APPROVAL BODY and shall be agreed with the manufacturer. The following gives guidance on the type of information required:

8.3.1 The ETA

See section 9 of this GUIDELINE.

8.3.2 Basic manufacturing process

The basic manufacturing process shall be described in sufficient detail to support the proposed FPC methods:

8.3.2.1 Product identification and traceability

The specific measures that are employed to identify and trace product passing through the production process shall be provided along with an explanation of any batch coding system. This may be in the form of a laying record detailing the delivery ticket number, confirmation of material type, delivery time and date of the hot mix asphalt and the position it is installed within the works, this will also apply to the bond coat.

8.3.2.2 Method of production and process control

The production process and process conditions should be described. Most of the information should have been provided as part of Chapter 7.

8.3.3 Product and materials specifications

The following should be provided:

8.3.3.1 Incoming materials specifications and declarations

8.3.3.2 References to European and/or international standards or appropriate specifications

8.3.3.3 Manufacturer's data sheets

8.3.4 Test plan (as part of FPC)

The manufacturer and the APPROVAL BODY issuing the ETA shall agree an FPC test plan.

An agreed FPC test plan is necessary as current standards relating to quality management systems (Guidance Paper B, EN ISO 9000:2000 and EN ISO 9001: 2000, etc), do not ensure that the product specification remains unchanged and they cannot address the technical validity of the type or frequency of checks/tests.

The validity of the type and frequency of checks/tests conducted during production and on the final product shall be considered. This will include the checks conducted during manufacture on properties that cannot be inspected at a later stage and checks on the final product. These will normally include:

8.3.4.1 Purchasing data and receiving inspection and testing

A list of each of the significant incoming products and the means of verification before use, identification of the property measured, etc.

Presentation of the information should be clearly set out, for instance, as text, in tables.

An example of typical details that may be supplied is given below:

Table 8.3.4.1.1-Example of presentation of identification and verification before use of significant incoming products

Incoming product	Identification (type, class, grade, specification, etc)	Original supplier	Property measured	Method of test	Frequency of testing	Acceptance limits
Bond system	As per 8.3.2.1		Identification	N/a	Every load delivered	Delivery ticket shall confirm correct material
Hot mix Asphalt			Organoleptic check	visual		Uniform in consistency, satisfactory binder coating etc
			Identification	N/a		Delivery ticket shall confirm correct material

8.3.4.2 In-process inspection and testing:

Details should be provided against the following headings. Below is a typical example of what may be considered as part of any FPC test plan:

Table 8.3.4.2.1 – Example of FPC test plan for bituminous mixture

Property measured	Method of test	Frequency of testing	Acceptance limits
Bitumen content	In accordance with EN 12697-1		In accordance with manufacturer declared values in Chapter 6
Particle size distribution	In accordance with EN 12697-2		
Compacted thickness of installed asphalt	Manufacturer should provide details as part of Chapter 7.		10-20mm
Delivery temperature	Manufacturer declared values, methods and frequency. This information will already have been provided as part of Chapter 7		
Compaction temperature range	Manufacturer declared values		

NOTE: Where samples are taken and at what frequency may be affected by whether it is possible to obtain a representative sample of the hot mix asphalt on delivery, for example in the lorry or in the hopper of the paver, or if a more suitable source is at the point of manufacture of the bituminous mixture.

Table 8.3.4.2.2 – Example of FPC test plan for Bond system

Property measured	Method of test	Frequency of testing	Acceptance limits
Rate of application with binder content of emulsion	In accordance with method detailed in Chapter 5		In accordance with manufacturer declared values in Chapter 6
Application temperature	Manual	Every load	In accordance with manufacturer declared value

8.3.4.3 Final inspection and testing

Details should be provided against the following headings. Below is a typical example of what should be considered as part of any FPC test plan:

Table 8.3.4.3.1 – Example of FPC test plan for Bond coat

Property measured	Method of test	Frequency of testing	Acceptance limits
Uniform surface	Visual inspection	Finished surface	Shall be consistent in texture with no visible defects

Table 8.3.4.3.2 – Example of FPC test plan for bituminous mixture

Property measured	Method of test	Frequency of testing	Acceptance limits
Uniform surface	Visual inspection	Finished surface	Shall be consistent with no visible defects

Where materials/components are not manufactured and tested by the supplier in accordance with agreed methods, then where appropriate they shall be subject to suitable checks/tests by the manufacturer before acceptance.

8.4 CE marking and information

The ETA shall indicate the information required to accompany the CE marking and the placement of CE marking and the accompanying information (the accompanying commercial documents)

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, where applicable (for AoC systems 1 and 2+).


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

- The name or identifying mark of the producer and the manufacturing plant,
- The last two digits of the year in which the CE marking was affixed,
- For AoC systems 1: the number of the EC certificate of conformity for the product, ²
- For AoC systems 2+ : the number of the EC certificate for the FPC,
- The number of the EUROPEAN TECHNICAL APPROVAL,
- The number of the EUROPEAN TECHNICAL APPROVAL GUIDELINE.

¹ Official Journal of the European Communities no L 220, 30/8/1993, p. 1.

² According to Guidance Paper D (this is not envisaged in the CPD itself)

Example of CE marking and information:

 1234
Any Company Street 1, City, Country 04 1234-CPD-0321
ETA-XX/XXXX ETAG 035

Letters "CE"

Identification number of notified certification body (for AoC systems 1+, 1 and 2+)

Name and address of the producer (legal entity responsible for the manufacture)

Two last digits of year of affixing CE marking
Number of EC certificate of conformity (for AoC systems 1+ and 1) or EC certificate for the FPC (for AoC systems 2+)

ETA number
ETAG number

Section four

9. 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.

Annex A

(definitions, clarifications, abbreviations)

COMMON TERMINOLOGY

A.1 Works and products

A.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).

A.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)

A.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.

A.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)

A.1.5. Execution (ETAG-format)

Used in this document to cover all types of incorporation techniques such as installation, assembling, incorporation, etc.

A.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.

A.2 Performances

A.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)

A.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).

A.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).

A.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, should 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.

A.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".

A.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.

A.3 Etag - Format

A.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.

A.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, 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".

A.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.

A.4 Working life

A.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.

A.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.

A.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.

A.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.

A.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.

A.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.

A.5 Conformity

A.5.1. Attestation and evaluation 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.

A.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.

A.6 Approval and approved bodies

A.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 EUROPEAN TECHNICAL APPROVALS 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.

A.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

Procedure for performance trial

B.1 System installation

B.1.1 The manufacturer shall arrange for the system performance trial, to demonstrate, verify and confirm the practicability of the methods of installation and the quality control procedures.

B.1.2 The trial shall be witnessed and assessed by the APPROVAL BODY to cover the manufacturer's installation procedures as defined in their installation laying procedure and as reported under Chapter 7.

B.1.3 The manufacturer shall arrange for a laboratory approved to carry out the road tests and take core samples for laboratory testing from the installation as detailed in Chapter 5.

B.1.4 Test methods and procedures are detailed in Chapter 5 and the performance levels, where applicable, are defined in Chapter 6

B.1.5 Where a system already has type approval, or part approval, from an overseeing organisation then existing data relating to the road trial carried out as part of the approval, if suitable, may be used for assessment purposes under this stage. The suitability of the data will be assessed by the APPROVAL BODY using the guidance in EOTA Guidance note n 004.

B.2 Monitoring of system installation

B.2.1 The system performance trial shall be required to assess the installation of the system and to monitor the systems performance over an agreed period using the suitability of data assessment detailed in clause 1.5 of this ANNEX. The trial for an UTLAC without an established history of use shall last for one year.

Table B.1 Validity period of ETA

Trial section	Validity of ETA
1 year	3 years*
History of a minimum of 2 years on 2 sites at least	5 years

*NOTE: 3 years could be extended to 5 years if there are sufficient evidence of performance on other trial installations.

B.2.2 The installation of the system shall be carried out and assessed as detailed in section 1.2 of this appendix.

B.2.3 The manufacturer shall arrange monitoring of the site with either an indicated laboratory or the APPROVAL BODY at intervals over the agreed trial period. A report shall be available to the APPROVAL BODY giving a brief description of the site. (See clause 2.4).

B.2.4 The following site performance tests shall be carried out to monitor the performance of the system over the agreed trial period:

B.2.4.1 Visual observation (a brief observation made of the site that surface remains free of significant defects)

B.2.4.2 Skid resistance in accordance with the test method detailed in Chapter 5.4.1

B.2.4.3 Texture depth in accordance with the test method detailed in Chapter 5.4.2

B.2.5 At the end of the agreed trial period an inspection of the system shall be carried out in accordance with ANNEX C.

Annex C

Methods of assessment on UTLAC: Visual assessment of defects

C.0 Foreword

These methods have been prepared by EOTA WG 01.05.01 and specify the method for the visual assessment of defects of UTLAC.

C.1 Scope

This method describes qualitative and quantitative test methods of the visual assessment of defects of UTLAC.

Defects emanating from the substrate (existing road) shall not be taken into consideration. Therefore this method includes a method for recording the condition of the existing road.

The qualitative and quantitative tests may be used separately or sequentially. This may relate to different types of site (for example lightly trafficked roads may not be required to be quantitatively assessed).

If the quantitative test method is applicable on the site, it is the method of reference in case of dispute.

NOTE: The test may be used to evaluate the durability of UTLAC.

C.2 Normative references

EN 13036-1 – Measurement of macro-texture by volumetric measurement - the patch test

EN 13043 – Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas

C.3 Terms, definitions and symbols

For the purposes of this method, the following terms, definitions and symbols apply:

C.3.1-Terms

Defect: State of a UTLAC where the material is affected by one or more of the effects defined in this method (see C3.2.1)

C.3.2-Definitions

C.3.2.1 Bleeding, fatting up:
Free binder at the surface.

NOTE: This may be due to the binder migrating to the surface (bleeding) or to coarse aggregate migrating downwards (fatting up) or a combination of the two, it is often difficult to visually separate the two causes.

C.3.2.2 Delamination:

Detachment of the UTLAC from the substrate, potholes or total loss equivalent to the depth of the surfacing

C.3.2.3 Ravelling

Loss of coarse aggregate from the UTLAC

C.3.2.4 Fretting

Loss of fine material from the UTLAC

C.3.2.5 Permanent deformation rutting

Permanent deformation may be caused by a number of different factors that may need further investigation to determine the mode of failure. For UTLAC this defect is not due to the material, but is the result of movement (deformation) of the substrate.

C.3.2.6 Variable aspect – tearing or open texture

Segregation due to low application temperature (asphalt mixes, support, or “plate of finisher” too cold), or to formulation (or mixing)

C.3.2.7 Crack

Line of discontinuity in UTLAC

NOTE: A crack may be caused by a number of different factors that may need further investigation to determine the mode of failure.

C.3.2.8 Small repetitive defects or groups of small defects.

Defects less than 1 m² and a dimension greater than 10 D where D is the upper aggregate size as defined in EN 13043 for the UTLAC being visually assessed.

NOTE: They may be grouped together for evaluation

C.3.2.9 Other defects

Defects caused by operations on the road since the UTLAC was laid, for example damage caused by winter maintenance or accident. These shall not be considered as a defect in this standard

Symbols

A ₁	the sum of the areas of bleeding fattening up in the 100 m section being considered in square metres (m ²).
A ₂	the sum of the areas of delamination, ravelling or fretting in the 100 m section being considered in square metres (m ²).
A ₃	the sum of the areas of variable aspects in the 100m section being considered in square metres (m ²)
A ₄	the sum of the areas of the rectangle or rectangles containing small repetitive defects or group of small defects in the 100 m section being considered in square metres (m ²).
D	upper aggregate sieve size of the UTLAC
P ₁	the proportion of area of bleeding, fattening up in the 100 m section being considered expressed as a percentage of the area of the section
P ₂	the proportion of area of delamination, ravelling or fretting in the 100 m section being considered expressed as a percentage of the area of the section
P ₃	the proportion of area of variable aspects in the 100 m section being considered expressed as a percentage of the area of the section
P ₄	the proportion of area of the rectangle or rectangles containing a group of small defects or small repetitive defects, in the 100 m section being considered expressed as a percentage of the area of the section plus the number of rectangles (in the form area + number)
S	area of 100 m long section of UTLAC in square metres (m ²).
W	mean width of lane in metres m

C.4 Visual Assessment of Defects

C.4.1 General

A 100 m ± 1 m section of UTLAC is chosen for visual assessment for each lane of the road.

Sections may be located anywhere along the road except that they shall not overlap.

The sections should be chosen in order to be representative of the number of defects in each section. If the defects are localised there may be only one section chosen in one lane for the entire length of road treated.

Where the whole site has defects to be evaluated, it may be convenient to divide it up into 100 m ± 1 m sections that are contiguous (for example a 1km road with no road markings would have ten sections, or twenty if there is a centre line marking).

NOTE 1: The remainder of the site that is not chosen for test or the area between sections is deemed to be without defects at the time of carrying out the test.

NOTE 2: Photographic records of sites and defects included in appendix CC may assist in assessment.

C.4.2 Initial assessment of site

Prior to the trial area being installed the manufacturer should carry out a survey of the existing surface noting and accurately locating any defects. Any defects recorded prior to surfacing shall not be used in the determination of the assessment of the surfacing.

NOTE 1 :The record can be used to eliminate from the final assessment those defects, such as cracking, which are caused by defects in the underlying structure. Some defects such as variable appearance of the final surface and deformation, may be contributed to by a variability in the substrate.

NOTE 2 :The location of defects can be done on a metrage basis along the length from a fixed datum and the distance from a fixed line.

NOTE 3: It is recommended that a full photographic record of the site is made. Sketches can also be useful.

C.4.3 Qualitative assessment

C.4.3.1 Procedure

The Qualitative assessment uses the Visual Assessment Report in Appendix CA.

Determine the section where the visual assessment is to be made (see 4.1).

For the defect being considered, if there is none detected by this qualitative visual assessment then “none” should be reported in Appendix CA.

C.4.3.2 Area defects

Estimate the area S of the 100m section.

Area defects shall be assessed individually if they are larger than 1 m^2 . Where they are smaller than this see C4.3.3.4.

C.4.3.3 Defects

C.4.3.3.1 Bleeding, fattening up

The areas of bleeding and fattening up shall be estimated and recorded if the individual area of a defect is more than 1 m^2 .

A_1 is the sum of these defects. P_1 is A_1 divided by S as a percentage (see 5.1.2 formula 1). P_1 shall be recorded in Appendix CA.

C.4.3.3.2 Delamination, ravelling, fretting, permanent deformation

The areas of these defects shall be estimated and recorded if the individual area of a defect is more than 1 m^2 .

A_2 is the sum of these defects. P_2 is A_2 divided by S as a percentage (see 5.1.2). P_2 shall be recorded in Appendix CA.

C.4.3.3.3 Variable aspects and cracks

The areas of these defects shall be estimated and recorded if the individual area of the defect is more than 1 m^2 .

A_3 is the sum of the areas of these defects. P_3 is A_3 divided by S as a percentage (see 5.1.2 formula 3). P_3 shall be recorded in ANNEX A.

C.4.3.3.4 Groups of small defects or small repetitive defects

Any defects with dimensions larger than $10D$ but smaller than 1 m^2 shall be estimated and grouped together if they are less than 5 m apart. The area to be recorded is that of the smallest rectangle that encompasses the group or repetitive defect.

NOTE: it is possible to have more than one rectangle in a section.

A_4 is the sum of the areas of these rectangles. P_4 is A_4 divided by S as a percentage (see 5.1.2 formula 4). P_4 shall be recorded in Appendix CA. The number of rectangles in the section shall also be recorded.

C.4.3.3.5 All other area defects

The area of these may be recorded for information but shall not be included in the overall assessment of the UTLAC.

C.4.4 Quantitative assessment

C.4.4.1 Procedure

The Quantitative assessment uses the Table of Results in ANNEX B.

Determine the lane section where measurements are to be made (see 4.1).

Measure the width of the section in metres to $0,1 \text{ m}$ at 6 positions along the section at approximately 20 m intervals to obtain a mean value W for determining the area of section S .

Measure the length of each defect to the nearest 0,1m and its width to the nearest 0,05 m.

C.4.4.2 Area defects

Area defects shall be assessed individually if they are larger than 1 m^2 . Where they are smaller than this see C.4.4.3.4.

Rectangular shape

Calculate the surface area of a rectangular shaped defect by multiplying the length by the width.

Non-rectangular shape

Calculate the surface area of a non-rectangular shaped defect by multiplying the maximum length by 0,8 times the maximum width.

C.4.4.3.1 Bleeding and fattening up

The areas of bleeding and fattening up shall be measured and recorded if the individual area of a defect is more than 1 m^2 .

A_1 is the sum of these defects. P_1 is A_1 divided by S as a percentage (see C5.1.2 formula 1). P_1 shall be recorded in Appendix CB.

C.4.4.3.2 Delamination, ravelling, fretting, permanent deformation

The areas of these defects shall be measured and recorded if the individual area of a defect is more than 1 m^2 .

A_2 is the sum of these defects. P_2 is A_2 divided by S as a percentage (see C5.1.2 formula 2). P_2 shall be recorded in Appendix CB.

C.4.4.3.3 Variable aspects and cracks

The areas of these defects shall be measured and recorded if the individual area of a defect is more than 1 m^2 .

A_3 is the sum of the areas of these defects. P_3 is A_3 divided by S as a percentage (see 5.1.2 formula 3). P_3 shall be recorded in Appendix CB.

C.4.4.3.4 Groups of small defects and small repetitive defects

Any defects with dimensions larger than $10D$ but smaller than 1 m^2 shall be grouped together if they are less than 5 m apart. The area to be measured and recorded is that of the smallest rectangle that encompasses the group or repetitive defect.

NOTE: it is possible to have more than one rectangle in a section.

A_4 is the sum of the areas of these rectangles. P_4 is A_4 divided by S as a percentage (see C5.1.2 formula 4). P_4 shall be recorded in Appendix CB. The number of rectangles in the section shall also be recorded.

C.4.4.3.5 All other area defects

The area of these may be recorded for information but shall not be included in the overall assessment of the UTLAC.

C.5 Expression of Results

C.5.1 General

The visual assessment of defects for UTLAC has four values:

P_1 the proportion of area of bleeding and fattening up in the 100 m section being considered expressed as a percentage of the area of the section

- P₂ the proportion of area of delamination, ravelling, fretting and permanent deformation in the 100 m section being considered expressed as a percentage of the area of the section
- P₃ the proportion of area of variable aspects and cracks in the 100 m section being considered expressed as a percentage of the area of the section
- P₄ the proportion of area of the rectangle or rectangles containing a group of small defects, sometimes repetitive, in the 100 m section being considered expressed as a percentage of the area of the section

C.5.1.1 Qualitative assessment

The visual assessment (drive over) report is completed and estimates of P₁, P₂, P₃, P₄ are reported (Appendix CA).

C.5.1.2 Quantitative assessment

The Table of Results is completed with measurements of P₁, P₂, P₃, P₄ (Appendix CB).

C.5.1.2.1 Bleeding and fatting up

Calculate the total area in the section expressed as a percentage, from equation (1):

$$P_1 = 100 \times A_1 / S \quad (1)$$

C.5.1.2.2 Delamination, ravelling, fretting and permanent deformation

Calculate the total area in the section expressed as a percentage, from equation (2):

$$P_2 = 100 \times A_2 / S \quad (2)$$

C.5.1.2.3 Variable aspects and cracks.

Calculate the total area in the section expressed as a percentage, from equation (3):

$$P_3 = 100 \times A_3 / S \quad (3)$$

C.5.1.2.4 Groups of small defects or small repetitive defects

Calculate the total area of rectangles containing the groups of small defects and repetitive small defects in the section expressed as a percentage, from equation (4):

$$P_4 = 100 \times A_4 / S \quad (4)$$

C.6 Test report

The test report shall refer to this ANNEX C and shall include the following information:

- a) References of site, section, place of inspection, lane,
- b) Estimated mean width of Lane and area of section,
- c) Method qualitative (drive over) or quantitative (measured),
- d) Visual estimate of areas and lengths of bleeding and fatting up,
- e) Visual estimate of areas and lengths of delamination,
- f) Visual estimate of areas and lengths of variable aspect,
- g) Visual estimate of areas and lengths of small repetitive defects,
- h) Number of rectangles containing defects
- i) Date of assessment

For the qualitative test an example of the information is detailed in Appendix CA and when the quantitative test is carried out the information is detailed in Appendix CB.

APPENDIX CA (informative)

QUALITATIVE ASSESSMENT – Estimated “drive-over” method

Example of Visual Assessment Report

The Report below is an example of a suitable layout. Other data may be included.

Qualitative Visual Assessment Report – estimated

Client:

Contractor:

Reference of the site.....

Total surface area of site: m²

Reference of the part covered with the UTLAC and date of installation:.....

Type of UTLAC:.....

Reference of the section					
Lane reference					
Exact place of inspection					
Estimated mean width of Lane	m	W			
Estimated Area of section $S = 100 \times W$	m ²	S			
Defects –visual estimate of areas and lengths:					
Bleeding and fatting up (4.2.1.1.1)	m ²	A ₁			
$P_1 = 100 \times A_1 / S$	%	P ₁			
Delamination, etc (4.2.1.1.2)	m ²	A ₂			
$P_2 = 100 \times A_2 / S$	%	P ₂			
Variable aspects, etc (4.2.1.1.3)	m ²	A ₃			
$P_3 = 100 \times A_3 / S$	%	P ₁			
Small repetitive defects (4.2.1.1.4)	m ²	A ₄			
Number of rectangles containing defects	no.				
$P_4 = 100 \times A_4 / S$	%	P ₄			

Remarks:

Date of assessment :

Name of the person responsible for assessment

Signature

APPENDIX CB (Informative)

QUANTITATIVE ASSESSMENT – Measured method

Table of Results

The Table below is an example of a suitable layout of results. Other data may be included.

Quantitative visual assessment Table of Results – measured

Client: Contractor:

Reference of the site Total surface area of site: m²

Reference of the part covered with the UTLAC and date of installation:.....

Type of UTLAC:.....

Reference of the section					
Lane reference					
Exact place of inspection					
Estimated mean width of Lane	m	W			
Estimated Area of section S = 100 x W	m ²	S			
Defects – Measured areas and lengths:					
Bleeding and fatting up (4.3.1.1.1)	m ²	A ₁			
P ₁ = 100 x A ₁ / S	%	P ₁			
Delamination, etc (4.3.1.1.2)	m ²	A ₂			
P ₂ = 100 x A ₂ / S	%	P ₂			
Variable aspects (4.3.1.1.3)	m ²	A ₃			
P ₃ = 100 x A ₃ / S	%	P ₃			
Small repetitive defects (4.3.1.1.4)	m ²	A ₄			
Number of rectangles containing defects	no.				
P ₄ = 100 x A ₄ / S	%	P ₄			

Remarks:

Date of test:

Name of the person responsible for test

Signature

APPENDIX CC (informative)

Photographs of Defects

The photographs included in this ANNEX consist of the following:

C1 – C4: Satisfactory UTLAC installations

C5 – C13: Various defects

These photographs are for information purposes only. They may assist the reader in defining the various defects listed within this visual assessment.



Figures C1, C2, C3 Satisfactory UTLAC



Figure C4 Satisfactory UTLAC – homogeneous texture



Figure C5 Delamination, fretting and ravelling



Figure C6 Ravelling and fretting



Figure C7 Ravelling on longitudinal joint



Figure C8 Transverse bump and localised fretting



Figure C9 Poor transversal joint



Figure C10 bleeding or fatting up of UTLAC (loss of macro-texture)

Annex D Torque Test Method

D.1 Scope

The following protocol describes methods for determining the Bond Strength between a thin surfacing system and its substrate, which may be bituminous or cementitious, by measuring the peak shearing torque, at a known temperature.

Two methods of test are described for tests carried out on site and on cores taken from site and tested in the laboratory.

In case of dispute, the test carried out in the laboratory is the reference test method.

The test shall only be carried out on thin surfacing systems which have been installed for a period of between 28 and 56 days⁽¹⁾.

D.2 Definitions

τ : inter-layer bond strength in kiloPascals (kPa),

M : peak value of applied shearing torque in Newton metres (N m),

D : diameter of core in millimetres (mm)

D.3 Apparatus

D.3.1 Equipment

D.3.1.1 *Core cutting apparatus*: suitable for cutting 100mm⁽¹⁾ diameter cores in bituminous and cementitious materials;

D.3.1.2 *Torque meter*: fitted with a fiducial reading gauge. The device shall be calibrated in order to be able to measure the torque at least to ± 10 N m. The device shall be fitted with a socket-fitting allowing steel plates to be fitted and removed.

D.3.1.3 *Metal Plate*: of mild steel having a diameter of (95 ± 5) , and a thickness of (14 ± 2) mm. The plate shall incorporate a fitting enabling it to be coupled to the torque meter.⁽²⁾

D.3.1.4 *Thermometer*: able to measure the ambient temperature to $\pm 0,5^\circ\text{C}$.

D.3.1.5 *Callipers*: for measurement of core diameters to $\pm 0,1$ mm;

D.3.1.6 Mould or other means of confining laboratory test samples for testing.

D.3.1.7 *Watch or Timer* able to give the time to ± 1 s.

D.3.1.8 *Mould*: for confining laboratory test specimens, (e.g. 150 mm concrete cube mould).

D3.1.9 *Spirit Level*: for checking laboratory test specimens;

D3.1.10 *Oven or refrigerated incubator (optional)*

NOTE 1 Cores may be cut prior to the 28 days post-installation period and stored at $5 \pm 2^\circ\text{C}$ prior to testing.

NOTE 2 Fittings of 12,7 mm and 19,05 mm have been found to be suitable.

D.3.2 Materials

D.3.2.1 *Adhesive*: (a stiff adhesive, such as rapid setting epoxy resin, with sufficient strength to avoid failure within the adhesive or at the adhesive/thin surfacing interface).

D.3.2.2 *Mounting material (for laboratory tests)*: e.g. rapid hardening mortar, concrete or grout.

D.4 Test methods

D.4.1 Site test method

D.4.1.1 Core the location to be tested using a 100 mm (± 5 mm) diameter core barrel to a depth of 20 mm below the thin surfacing layer to be tested. The method for sampling shall be to cut six cores at nominally even spacing along a diagonal line across the lane width. Cores shall be taken from a 100m length of the installation or the total installation where this is less than 100m.

D.4.1.2 Ensure that all debris is removed from the rebate formed by the core barrel. Clean and dry the surface to be tested.

D.4.1.3 Use the bonding agent to secure the metal plate to the surface of the core, taking care to ensure that the plate is parallel to the surface.

D.4.1.4 When the bonding agent has developed sufficient strength, (i.e. failure should not occur within the adhesive), fit the torque meter to the metal plate, using adapters and extension rods as appropriate.

D.4.1.5 Apply torque to the core at a steady rate so that the torque wrench sweeps an angle of 90° within (30 ± 15) s. Care must be taken to ensure that the torque is applied parallel to the core surface (within $\pm 10^\circ$). Torque is applied to the plate until failure of the bond occurs or a torque of 300 N m is exceeded.

D.4.1.6 Record the value of torque at failure, M, in Newton metres to ± 10 Nm. Measure and record the bond interface temperature immediately after failure to $\pm 0,5^\circ\text{C}$.

D.4.1.7 Examine the core and substrate and record the condition of the bond interface (e.g. smooth, planer, rough or irregular). Record the substrate type (e.g. bituminous or cementitious surface). Where known record details of the substrate condition prior to surfacing, (i.e. planed, untreated or regulated).

D.4.1.8 Measure and record the core diameter at two locations approximately 90° apart using callipers and record the mean value, D, to an accuracy of 1 mm.

D.4.1.9 Measure and record the depth of the surfacing to the substrate interface to an accuracy of 1mm.

D.4.1.10 Calculate the bond strength in accordance with section D.5.

D.4.2 Laboratory test method

D.4.2.1 Cut a 100mm (or 150mm) diameter core to a minimum depth of 80mm below the bottom of the surface layer. Extract the core taking care not to damage the surface layer of the core or the bond interface with the substrate. Six such cores shall be taken along a 100m length of the installation at nominally even spacing along a diagonal line across the lane width.

D.4.2.2 Trim die core to a length suitable for mounting if appropriate.

D.4.2.3 Place the core in the mould, using mortar or grout as a bedding layer if appropriate, so that the upper layer and the bond interface to be tested is (20 ± 10) mm above the rim of the mould.

Fill the mould with the mortar/grout and trim flush with the mould rim, ensuring that the core is perpendicular to, and the upper surface parallel with, the mould surface. Check using the spirit level.

D.4.2.4 Fix the metal plate to the core using the adhesive and allow to set.

D.4.2.5 Unless otherwise specified, condition the mounted cores by storing at a temperature of $(20\pm 2)^{\circ}\text{C}$ for a minimum of 4 hours and for not more than 16 hours before testing. Record the times and temperatures employed.

D.4.2.6 Unless otherwise specified, test the core at a temperature of $(20\pm 2)^{\circ}\text{C}$: where other temperatures are used, the test shall be completed within 5 min of removal from the conditioning environment.

D.4.2.7 Fix or clamp the mould containing the mounted core to a suitably rigid surface. Carry out the test as described in D.4.1.5.

D.4.2.8 Examine the core and record all the relevant information as described in D.4.1.6 to D.4.1.9.

D.5 Calculation of Bond Strength and expression of results

Calculate the bond strength for each specimen using the following formula :

$$\tau = \frac{12M \times 10^6}{\pi D^3}$$

Calculate the arithmetic mean of the inter-layer bond strength, τ , for the six specimens

D.6 Test report

The test report shall include the following information:

- a) Name of organisation carrying out the test
- b) Method of test used
- c) Description of materials (system and substrate)
- d) Date of test
- e) Peak torque at failure (N m)
- f) Inter-layer bond strength (kPa), (individual and mean values)
- g) Time to failure (seconds)
- h) Diameter of core (mm)
- i) Depth of Bond interface (mm)
- j) Temperature of the Bond interface at test ($^{\circ}\text{C}$)
- k) Conditioning details (duration and temperature)
- l) Site or Laboratory test
- m) Identification of Site or Scheme
- n) Core location
- o) Age of the installation / specimen at the time of test
- p) Nature of the Bond interface
- q) Mode of Failure

D.7 Precision

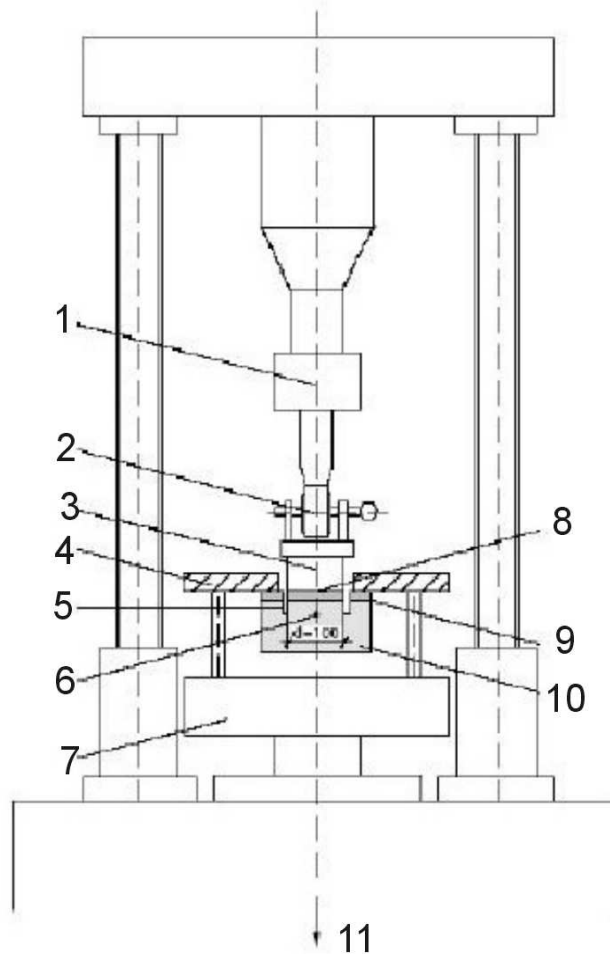
The precision for this test method has not been determined.

NOTE: Temperatures outside this range may be specified, e.g. in order to compare data obtained from site tests carried out at temperatures other than $(20\pm 2)^{\circ}\text{C}$. In this case additional laboratory apparatus (i.e. ovens or refrigerated incubators) may be required. Conditioning of specimens in a soaked condition may also be undertaken. Details of the conditioning used prior to testing has to be declared.

Annex E Direct Tensile Test Method

E.1 Scope

The procedure is used to ascertain the adhesive strength (pull-off resistance) between the thin layers in hot and cold installation and their substrate. The test is carried out on drilling cores (Diameter 150 mm) using a tensile testing machine. A system drawing is attached in Figure E.1.



Key

- | | |
|--------------------------------------|--|
| 1 Power transducer | 7 Support bench |
| 2 Ball joint | 8 Adhered joint |
| 3 Indenter | 9 DSK/DSH* |
| 4 Holding plate in the cross section | 10 Base of the DSK/DSH |
| 5 Ring groove | 11 Direction of pull |
| 6 Temperature probe | *DSK = thin section in cold installation, DSH = thin section in hot installation |

Figure E1 - Example of test set-up for ascertaining the adhesive strength of thin layers in hot and cold - installation – system drawing

E.2 Description of the procedure

An indenter is adhered to the cut and ground surface of the thin layer and pulled off using a suitable tensile testing machine vertical to the surface at a constant testing temperature and load application speed. The maximum active force referred to the pull-off surface is the adhesive strength (pull-off resistance).

E.3 Equipment and testing instruments

The following equipment and testing instruments are required to perform the test:

- Tensile testing machine, which allows for the tensile stress to be applied at a constant load application speed, to $\pm 10\%$, without any jolts and vertical to the test surface. The maximum tensile force shall be at least 30 kN.
- Indenter with diameter of 100 mm $\pm 0,1$ mm. Thickness of the indenter without any weakening in the cross section (e.g. screwed-on eyelets) > 25 mm, material St. 52.
- Steel ring with inner diameter 105 mm and outer diameter 300 mm, material St 52, 25 mm thick including accessories to safeguard a firm connection between drilling core and support bench of the tensile testing machine.
- Pasty solvent-free adhesive suitable for asphalt surfaces,
- Thermometer for measuring the temperature of the sample to $\pm 0,5^{\circ}\text{C}$,
- Core drilling machine with diamond bit, inner diameter 100 mm ± 2 mm, with adjustable drilling depth
- Grinding machine for preparing the core surface.
- Adjustable air bath, for adjusting the temperature of the test cores to $8^{\circ}\text{C} \pm 0,5^{\circ}\text{C}$

E.4 Samples

The samples consist of drilling cores with a diameter of approx. 150 mm. At least 3 drilling cores are to be taken from the area of the right-hand track of the carriageway, with spacing of approx. 5 cm between the edges of the drilling cores. The drilling cores must be at least 6 cm thick. Any damage to the drilling core jacket and head surface must be avoided while taking the core samples. Damaged drilling cores are to be rejected.

E.5 Test procedure

E.5.1 Preparing the drilling cores

The drilling cores are cut to a thickness of at least 6 cm and ground flat on the underneath, vertical to the jacket surface. A ring groove is then cut in the core surface with a core drill down to approx. 10 mm in the layer below the thin layer. Care shall be taken to ensure that absolutely no damage is caused to the core during this drilling process (e.g. chips flaking off, edges breaking).

This is why the ring groove must be drilled with a flawless, undamaged bit in a centred position, smoothly and without imbalance in the bit. The inner diameter of the drilled test surface shall be 100 mm ± 2 mm. The test surface is defined as the area within the ring groove.

The next step consists in grinding the core surface. This guarantees that the indenter can be adhered firmly and fully to the complete surface. The grinding process depends on the roughness of the core surface; 2 to 3 mm are usually sufficient.

For temperature measurements during the test, a hole has to be drilled at right angles to the jacket surface of the core approx. 20 mm below the thin layer. The hole extends to the middle of the core. The thickness of the hole depends on the thickness of the digital thermometer probe. The hole is sealed with a suitable

compound, e.g. putty.

E.5.2 Adhering the indenter

Before adhering the indenter, the ground test surface is checked carefully to make sure that it is absolutely clean. It must be free of dust and grease, and dry. The adhesive is used to adhere the indenter flush to the complete test surface. The ring groove must remain completely free of adhesive. The curing time for the adhesive is at least 6 hours at room temperature.

E.5.3 Adjusting the temperature of the cores

The prepared cores including adhered indenter are adjusted to a temperature of $8^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ for at least 12 hours before the test. After storage at this holding temperature, the core is fitted in the tensile testing machine and the increase in temperature within the thin layer is monitored continuously using the digital thermometer introduced into every core. The test starts once a temperature of $10^{\circ}\text{C} \pm 0,5^{\circ}\text{C}$ has been reached.

Previous experience indicates that there is no need for a temperature chamber to maintain the prescribed temperature during the pull-off test.

E.5.4 Pull-off test

The indenter is connected with the tensile testing machine, with the steel ring adhering to the support bench. Load is then applied at a constant speed to $\pm 10\%$, of $0,025 \text{ N/mm}^2/\text{s}$ (corresponding to approx. 200 N/s for an indenter diameter of 100 mm) until the pull-off point is reached.

The maximum tensile force is read off in N and the diameter of the test surface is measured with an accuracy of $\pm 0,5 \text{ mm}$. In addition, the temperature of the core is recorded at the beginning and end of the test.

E.6 Results

A report is to be drawn up for every pull-off test. The adhesive strength σ_{HZ} [N/mm^2] shall be calculated using the ascertained maximum tensile force F and the test area A as follows:

$$\sigma_{\text{HZ}} = F/A$$

If the diameter of the test surface is larger than the diameter of the indenter, then A is the area of the indenter.

The adhesive strength is to be stated as the mean value from 3 individual values, rounded to $0,1 \text{ N/mm}^2$.

The position of the broken surface is to be stated for every single test according to the following classification, together with remarks as to whether this is primarily a cohesion or adhesion break: within the thin layer (cohesion break) partly in the boundary layer, partly in the thin layer (mixed break) in the boundary layer (adhesion break) partly in the boundary layer, partly in the substrate in the substrate partly or completely in the adhered joint.

If the break changes along its development, the corresponding shares are to be estimated.

When taking the mean values, only results with a break position in A, B or C are taken into consideration.

Breaks taking place more than 25% in the substrate (break position D and E) and breaks partly or completely in the adhered joint (break position F) are not included in taking the mean values. If in this case the ascertained values for adhesive strength exceed the required value, then the results of the test are assessed as conforming with requirements. If in this case the ascertained values for adhesive strength fall short of the requirement value, it is not possible to state whether the results conform with the requirements.

E.7 Test report

The test report shall include :

Location of the test,
Temperature of the test,
Adhesive strength, as mean value of at least 2 individual measurements,
Type of break.

E.8 Precision

The precision of this test method has not been carried out yet.

E.9 Bibliography

- [1] Quantifizierung des Schichtenverbundes von dünnen Asphaltsschichten im Heißeinbau mit dem Abziehversuch. Schlussbericht zum Forschungsvorhaben FA 7.183 des BMVBW, IFM Dr. Schellenberg Ing.-GmbH, Leipheim [*Quantification of the laminar structure of thin asphalt layers in thin installation with the pull-off test. Final result of the research project FA 7.183 of BMVBW, IFM Dr. Schellenberg Ing.-GmbH, Leipheim*], published in "Forschung Straßenbau und Straßenverkehrstechnik", issue 830, 2002.
- [2] Graf , K.; Vassil iou, K.: Prüfung der Haftzugfestigkeit von Dünnen Schichten im Kalteinbau (DSK) [*Testing the adhesive strength of thin layers in cold installation (DSK)*], Strasse und Autobahn, issue 5/1997, page 283 - 243