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**ETAG n°32**

Edition of May 2013

**GUIDELINE FOR EUROPEAN TECHNICAL  
APPROVAL**

of

**EXPANSION JOINTS FOR ROAD BRIDGES**

**PART 4: NOSING EXPANSION JOINTS**

EOTA 2013

KUNSTLAAN 40, AVENUE DES ARTS

1040 BRUSSELS

BELGIUM

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# FOREWORD

See Part 1 of this ETAG N° 032.

## REFERENCE DOCUMENTS

See Part 1 of this ETAG N° 032.

### Additional list of standards referred to in this family part

Standards	Clause in this part of ETAG	Title
EN 206-1	5.2, 8.3	Concrete – Part 1: Specification, performance, production and conformity
EN 573-3	5.2 – 8.3	Aluminium and aluminium alloys – Chemical composition and form of wrought products – Part 3: Chemical composition
EN 1097-2	5.2 – 8.3	Tests for mechanical and physical properties of aggregates – Part 2: Methods for the determination of resistance to fragmentation
EN 1097-8	5.2 – 8.3	Tests for mechanical and physical properties of aggregates – Part 8: Determination of the polished stone value
EN 1676	5.2 – 8.3	Aluminium and aluminium alloys – Alloyed ingots for remelting – Specifications
EN 10204	8.2 - 8.3	Metallic products – Types of inspection documents
EN 10025	5.2 – 8.3	Hot rolled products of structural steels
EN 10080	5.2 – 8.3	Steel for the reinforcement of concrete – Weldable reinforcing steel – General
EN 10088	5.2 – 8.3	Stainless steels – All parts
EN ISO 1461	5.2 – 8.3	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods
EN ISO 11358	5.2	Plastics – Thermogravimetry (TG) of polymers – General principles
EN ISO 12944-2	5.1.7.1	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 2: Classification of environments
EN ISO 9002	8.3	Quality systems – Model for quality in production and installation
ISO 34-1 Method A	5.2 - 8.3	Rubber, vulcanized or thermoplastic – Determination of tear strength – Part 1: Trouser, angle and crescent test pieces
ISO 37	5.2 – 8.3	Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties
ISO 48	5.2 – 8.3	Rubber, vulcanized or thermoplastic – Determination of hardness (Hardness between 10 IRHD and 100 IRHD)
ISO 812	5.1.7.2 – 5.2	Rubber, vulcanized or thermoplastic – Determination of low-temperature brittleness
ISO 815-1	5.2 – 6.2 – 8.3	Rubber, vulcanized or thermoplastic – Determination of compression set at ambient, elevated or low temperatures
ISO 1083	5.2 – 8.3	Spheroidal graphite cast irons – Classification
ISO 1431-1	5.2	Rubber, vulcanized or thermoplastic – Resistance to ozone cracking – Part 1: Static and dynamic strain testing / Note: Corrected and reprinted of French version in 2006-12 * To be amended by ISO 1431-1 DAM 1 (2007-12)
ISO 1817	5.2	Rubber, vulcanized – Determination of the effect of liquids
ISO 2781, Technical corrections 1 (06-1996)	5.2 – 8.3	Rubber, vulcanized – Determination of density – Technical corrigendum 1 to standard ISO 2781:1988
ISO 3417	5.2	Rubber – Measurement of vulcanization characteristics with the oscillating disc curemeter
ISO 6502	5.2	Rubber – Guide to the use of curemeters
ISO 7619-2	5.2 – 8.3	Rubber, vulcanized or thermoplastic – Determination of indentation hardness – Part 2: IRHD pocket meter method
ISO 9924-1 and 2	5.2	Rubber and rubber products – Determination of the composition of vulcanizates and uncured compounds by thermogravimetry – Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers Part 2: Acrylonitrile-butadiene and halobutyl rubbers
ASTM D 6370	5.2	Standard Test Method for Rubber-Compositional Analysis by Thermogravimetry (TGA) / Note: Re-approved 2003

**Note:** Some of these standards are also referred to in Part 1.

# Section one: INTRODUCTION

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## PRELIMINARIES

### 1.1 LEGAL BASIS

See Part 1 of this ETAG N° 032.

### 1.2 STATUS OF ETAG

See Part 1 of this ETAG N° 032.

This document shall be used in conjunction with ETAG N° 032, Expansion joints for road bridges Part 1. If the text in Part 1 applies to this family of products then reference will be made to the appropriate clause in Part 1 ("See Part 1 of this ETAG N° 032").

## 2. SCOPE

### 2.1 SCOPE AND DEFINITION

#### 2.1.1 General

This Part of the ETAG specifies the product performance characteristics, methods of verification and assessment procedures for Nosing Expansion Joints for road bridges to ensure the fitness of the products for their intended use.

This Guideline applies the expansion joints for road bridges used to ensure the continuity of the running surface as well as its load bearing capacity and the movement of the bridges whatever the nature of the structure constitutive material (concrete, steel, ...).

The products are designed, manufactured and installed in accordance with the ETA holder's design and installation guide.

Expansion joints for moveable bridges are not covered by this Guideline.

#### 2.1.2 Definitions

The following definition details the general definition given in 2.1.2.2 of Part 1 of this ETAG N°032.

A Nosing Expansion Joint comprises:

- Edges made of metal runners, concrete, resin mortar, elastomer, ... and their anchorage in the adjacent structure. The structural part which forms the edge in contact with the wheel loads shall be fully supported (e.g. the figures in Annex 4-M); it shall only form a cantilever if it is designed to transmit the loads.
- A flexible sealing element with a sufficient capacity to accommodate the movements filling the gap between the edges. The sealing element is not flush with the running surface and does not support the wheel.
- A single gap according to the definition given in Part 1 for "surface gap".

For gap definition: see Part 1 of this ETAG N° 032, 3.2.1.

## **2.2 USE CATEGORIES AND KITS**

### **2.2.1 Use categories**

See Part 1 of this ETAG N° 032.

### **2.2.2 Kits**

See Part 1 of this ETAG N° 032.

In addition to Part 1 of this ETAG N° 032, the following applies:

According to the concept given in Annex 4M, key, case 1.3, the transition strip is part of the product.

If the connecting material (see Annex 4M) is not a part of the product, the minimum requirement shall be specified as indicated in 7.1 of Chapter 7 of Part 1 of this ETAG N° 032 and shall be used, if needed, during testing.

The upstand is part of the kit.

## **2.3 ASSUMPTIONS**

See Part 1 of this ETAG N°032.

### **2.3.1 Main structure**

See Part 1 of this ETAG N° 032.

### **2.3.2 Temperatures**

See Part 1 of this ETAG N° 032.

All ranges of operating temperatures according to ETAG N° 032, Part 1, apply.

To demonstrate that materials are fit for the use over the temperature range chosen by the manufacturer, appropriate test(s)/verification (i.e. brittleness test for rubber at low temperature, appropriate steel or aluminium alloy for low temperature) shall be made.

### **2.3.3 Installation**

See Part 1 of this ETAG N° 032.

### **2.3.4 Working life**

See Part 1 of this ETAG N° 032.

All categories according to Part 1 apply.

Replaceable components which have a working life shorter than for the kit shall be addressed in the ETA.

## **3. TERMINOLOGY**

### **3.1 COMMON TERMINOLOGY AND ABBREVIATIONS**

See Part 1 of this ETAG N°032.

## **3.2 TERMINOLOGY AND ABBREVIATIONS SPECIFIC TO THIS ETAG**

### **3.2.1 Terminology**

See Part 1 of this ETAG N° 032. For additional terms and definitions specific for this family Part, see Annex 4-M.

### **3.2.2 Abbreviations**

See Part 1 of this ETAG N° 032.

# **Section two: GUIDANCE FOR THE ASSESSMENT OF THE FITNESS FOR USE**

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## **GENERAL NOTES**

See Part 1 of this ETAG N° 032.

## **4. REQUIREMENTS**

**For the works and their relationship to the Road Bridge Expansion Joint characteristics**

See Part 1 of this ETAG N° 032.

### **4.0 TABLE LINKING THE ESSENTIAL REQUIREMENTS TO PRODUCT PERFORMANCE**

#### **Comprehensive table**

See the comprehensive table of Part 1 of this ETAG N° 032 but the clauses in the last column refer to this Part of the ETAG.

## **4.1 KITS**

### **4.1.1 Mechanical resistance and stability**

#### **4.1.1.1 General**

Annex G of Part 1 is relevant for this family Part with the following precisions:

- Generally due to the width in the traffic direction, the products of this family are concerned only by the column  $W_j \leq 1,2$  m of Table G2.
- Anchorages and transition strips shall be designed for the loads given in Annex G of Part 1 of this ETAG N° 032.

The general criteria defined in Part 1 (Table 4.1.1) of this ETAG N° 032 apply.

#### **4.1.1.2 Mechanical resistance**

See Part 1 of this ETAG N° 032.

SLS conditions according to Part 1 apply.

The ULS criteria for the Nosing Expansion Joints are given only due to the maximum opening position and not influenced by imposed displacement at ULS of the main structure according to Table 4.1.1 in ETAG N° 032, Part 1.

#### **4.1.1.3 Resistance to fatigue**

##### *4.1.1.3.1 General*

See Part 1 of this ETAG N° 032.

##### *4.1.1.3.2 Actions for fatigue assessment*

The actions, loads and combinations are given in Annex G of Part 1 of this ETAG N° 032.



#### 4.1.1.4 Seismic behaviour

Table 4.1.1.4 of Part 1 of this ETAG N° 032 applies with the exception that the refitting of the sealing element for "expected repair work after earthquake" may be accepted for approaches A2, B1 and B2.

#### 4.1.1.5 Movement capacity

See Part 1 of this ETAG N° 032.

The influence of displacement velocity and the temperature is not relevant for this family product.

No additional allowance for displacements and corresponding rotation for this family product.

#### 4.1.1.6 Cleanability

See Part 1 of this ETAG N° 032.

The fixing of the sealing element and the movement capacity shall not be influenced by joint opening and/or accumulation of debris (sand, stones ...).

#### 4.1.1.7 Resistance to wear

Not relevant for this family Part.

#### 4.1.1.8 Watertightness

See Part 1 of this ETAG N° 032.

### 4.1.2 Safety in case of fire

According to Part 1 of this ETAG N° 032: not relevant.

### 4.1.3 Hygiene, health and environment

See Part 1 of this ETAG N° 032.

### 4.1.4 Safety in use

#### 4.1.4.1 Ability to bridge gaps and levels in the running surface

##### 4.1.4.1.1 Allowable surface gaps and voids

See Part 1 of this ETAG N° 032.

##### 4.1.4.1.2 Level differences in the running surface

See Part 1 of this ETAG N° 032.

Where a transition strip is part of the product, the relative slope of the line between the adjacent surfacing and the metal runner profile in the direction of the traffic shall not be greater than 2 %. See Figure 4.1. In case of Nosing Expansion Joint without transition strip, the value of slope is not relevant.

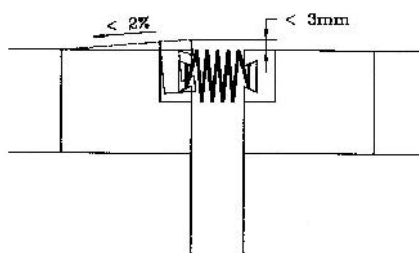


Figure 4.1: Level differences

#### **4.1.4.2 Skid resistance**

See Part 1 of this ETAG N° 032.

#### **4.1.4.3 Drainage capacity**

See Part 1 of this ETAG N° 032.

#### **4.1.5 Protection against noise**

According to Part 1 of this ETAG N° 032: not relevant.

#### **4.1.6 Energy economy and heat retention**

According to Part 1 of this ETAG N° 032: not relevant.

#### **4.1.7 Aspects of durability, serviceability and identification of the products**

See Part 1 of this ETAG N° 032.

##### **4.1.7.1 Aspects of durability**

See Part 1 of this ETAG N° 032.

##### **4.1.7.2 Aspects of serviceability**

See Part 1 of this ETAG N° 032.

##### **4.1.7.3 Aspects of identification**

See Part 1 of this ETAG N° 032.

A Nosing Expansion Joint is supplied to construction site as a kit of components.

The manufacturer shall identify the components:

- Manufacturer's name and address,
- Type of product,
- Batch number,
- Date of manufacture.

## **4.2 COMPONENTS**

See Part 1 of this ETAG N° 032.

The manufacturer shall present a list of components with the material characteristics (including tolerances) as given in Table 5.2 in this family Part. Testing shall be carried out to demonstrate that the product meets the declared characteristics.

Components shall be defined and specified in the Technical Manual according to their function and their role in the product. This shall include their characteristics, method of handling and their source of supply.

The tests determine the material characteristics and performance.

The Approval Body shall identify the characteristics of the components of a Nosing Expansion Joint which have to be verified during the approval procedure in accordance with this Part of the ETA Guideline.

## 5. METHODS OF VERIFICATION

See Part 1 of this ETAG N° 032.

### 5.0 GENERAL

#### Comprehensive table

See the comprehensive table of Part 1 of this ETAG N° 032 but the clauses in the last column refer to this Part of the ETAG.

### 5.1 KITS

#### 5.1.1 Mechanical resistance and stability

##### 5.1.1.1 General

See Part 1 of this ETAG N° 032.

For the load distribution Figure 5.1.1.1 applies in the following way:

- The loads on the areas of zones 5' and 5'' shall be added on the supporting area of zone 3;
- Load on zone 4 is not added to the load on expansion joint area A'.

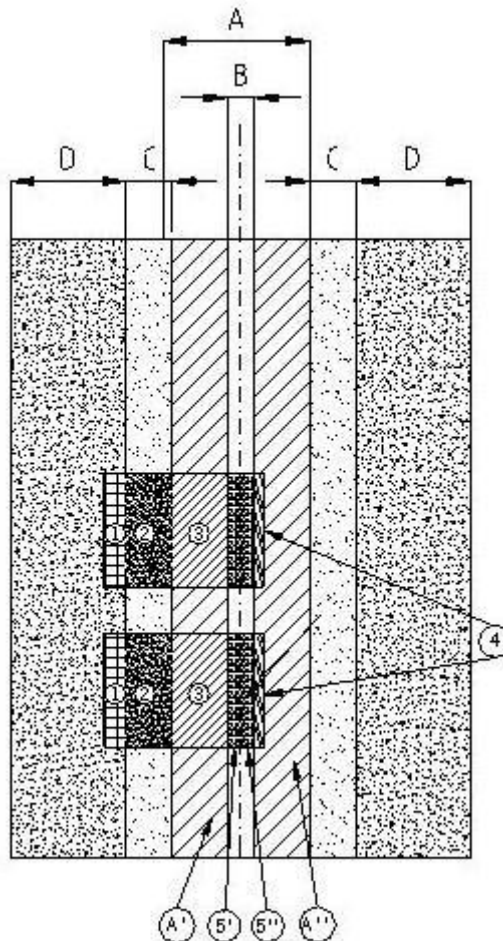


Figure 5.1.1.1: Load distribution for nosing expansion joints

### 5.1.1.2 Mechanical resistance

See Part 1 of this ETAG N° 032.

The mechanical resistance of design concepts, as described in Annex 4-M, shall be verified in an appropriate way by means of calculation, as the resistances of materials and components can be derived from standards.

If this approach cannot be fully applied, complementary test(s) using the principles and conditions given in Annex G of Part 1 shall be used. The evaluation method shall be stated in the ETA evaluation report.

Only vertical actions and horizontal action in the traffic direction, given in Annex G of Part 1 of this ETAG N° 032, shall be verified.

**Note:** Due to the design of this family product, the force parallel to the joint axis will be transferred to the joint as a whole and is usually negligible.

### 5.1.1.3 Resistance to fatigue

See Part 1 of this ETAG N° 032.

Considering the statements in Part 1 of this ETAG N° 032, regarding the amplification factor, the factor shall be taken as 1.

Resistance to fatigue shall be verified by means of calculation and/or testing.

#### 5.1.1.3.1 Calculations

Resistance to fatigue has to be verified in accordance with Part 1 of this ETAG N° 032.

Only vertical actions and horizontal action in the traffic direction, given in Annex G of Part 1, shall be verified.

**Note:** Due to the design of this family product, the force parallel to the joint axis will be transferred to the joint as a whole and is usually negligible.

#### 5.1.1.3.2 Testing

If complete verification by calculation is not possible (e.g. type 2c and d, Annex 4-M), Annex 4.N applies.

For a transition strip which is part of the kit and made with bitumen material, the verification method according EN 12697-22 shall be used.

### 5.1.1.4 Seismic behaviour

See Part 1 of this ETAG N° 032.

### 5.1.1.5 Movement capacity

See Part 1 of this ETAG N° 032.

With reference to the note in Part 1, all types of Nosing Expansion Joint shall be tested.

For a sealing element without mechanical fixing in edge profiles ("compression seals"), the effect of creep and/or relaxation of the sealing element shall be considered by a pre-compression time of 24 h at the minimum opening before starting the test.

#### **5.1.1.6 Cleanability**

See Part 1 of this ETAG N° 032.

In case the influence of the joint opening and closing on the accumulation of debris (sand, stones ...) is verified by an additional test, the movement capacity verification test according to Annex K of Part 1 is used. For this purpose:

- At the end of the 6<sup>th</sup> cycle an opening corresponding to 120 % of the nominal opening is applied to verify the proper fixing and the mechanical resistance of the sealing element,
- During the 3<sup>rd</sup> and 4<sup>th</sup> cycles, addition of sand (aggregate size 1,5 mm) according to Part 1.

#### **5.1.1.7 Resistance to wear**

Not relevant for this family product.

#### **5.1.1.8 Watertightness**

See Part 1 of this ETAG N° 032.

For the test method, according to L.5.3 of Part 1 of this ETAG N° 032, the value of opening used for testing is defined by the worst condition which is the minimum contact pressure between seal element and edge profiles.

According to L.5.1, for a sealing element without mechanical fixing in edge profiles ("compression seals") the effect of creep and/or relaxation of the sealing element shall be considered by a pre-compression time of 24 h at the minimum opening before starting the test.

### **5.1.2 Safety in case of fire**

According to Part 1 of this ETAG 032: not relevant.

### **5.1.3 Hygiene, health and environment**

See Part 1 of this ETAG N° 032.

### **5.1.4 Safety in use**

#### **5.1.4.1 Ability to bridge gaps and levels in the running surface**

##### *5.1.4.1.1 Allowable surface gaps and voids*

See Part 1 of this ETAG N° 032.

##### *5.1.4.1.2 Level differences in the running surface*

See Part 1 of this ETAG N° 032.

The additional deformation under loading condition according to Annex G (in Part 1 of this ETAG N° 032) is verified (by testing, see 4.N.8.2 in Annex 4N or by calculation).

#### **5.1.4.2 Skid resistance**

See Part 1 of this ETAG N° 032.

#### **5.1.4.3 Drainage capacity**

See Part 1 of this ETAG N° 032.

### **5.1.5 Protection against noise**

According to Part 1 of this ETAG N° 032: not relevant.

### **5.1.6 Energy economy and heat retention**

According to Part 1 of this ETAG N° 032: not relevant.

### **5.1.7 Aspects of durability, serviceability and identification of the products**

See Part 1 of this ETAG N° 032.

#### **5.1.7.1 Aspects of durability**

See Part 1 of this ETAG N° 032.

For resistance to corrosion see ETAG N° 032, Part 1.

For metallic surfaces of components made out of steel and protected by painting, the climatic classification in accordance with EN ISO 12944-2 with respect to the intended use of the product shall be taken into account.

Durability under UV radiation, 5.1.7.1.3b of Part 1 of this ETAG N° 032 is not relevant for this family product for the transition strip.

For durability under ozone, verifications shall be carried out according to 5.2 of this ETAG Part, taking into account the precisions in this clause for this product family.

#### **5.1.7.2 Aspects of serviceability**

See Part 1 of this ETAG N° 032.

With respect to the operating temperature condition, according to 2.3.2, for the execution of the brittleness test (ISO 812) the following temperatures apply:

- 25 °C for operating temperatures down to -20 °C,
- 40 °C for operating temperature equal to -30 °C,
- 55 °C for operating temperature equal to -40 °C.

#### **5.1.7.3 Aspects of identification**

See Part 1 of this ETAG N° 032.

## **5.2 COMPONENTS**

See Part 1 of this ETAG N° 032.

The manufacturer shall present a list of components with test methods and/or standards.

Table 5.2 below gives requirements and assessment methods which shall be used where they are applicable. Where the methods do not apply or do not assess the correct characteristics for that component/material, alternative assessment methods, based in preference on European or ISO standards, shall be used by agreement between the ETA applicant and the Approval Body. Details shall be given in the Evaluation Report.

Table 5.2: Requirements and assessment methods

Material/component	Characteristics	Test method(s)
Elastomer piece	On sampling:	
	- Density,	According to ISO 2781 Technical corrections 1 (1996)
	- Hardness IRHD,	According to ISO 48 or ISO 7619-2
	- Tensile strength ,	According to ISO 37,
	- Elongation at break,	According to ISO 37
	- Tear resistance,	According to ISO 34-1 Method A
	- Thermo gravimetric analysis (TGA),	Relevant standards: EN ISO 11358, ISO 9924-1, -2; ASTM D 6370
	- Rheometric characteristics,	According to ISO 3417, ISO 6502
	- Compression set.	According to ISO 815-1 24 h and 70 °C constant deflexion 25 %
	- Brittleness test	According to ISO 812
- Resistance to de-icing agents	ISO 1817, 14 days 23 °C, 4% sodium-chloride solution or equivalent	
- Resistance to ozone	ISO 1431-1, Test procedure A (static strain testing), strip specimens with an elongation of 20 %, 72 h, test temperature 40 °C (± 2 °C), Ozone concentration: 50 (± 5) ppm	
Steel pieces	On sampling: - Elasticity limit $f_{0,2k}$ at 0,2 %, - Tensile strength, - Elongation at break, - Energy absorption (Charpy-V test) (if dynamically loaded), - Chemical composition.	EN 10025, EN 10088
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	See Part 1, 5.1.7.1.1
Piece in cast iron and/or cast steel	On sampling and where relevant: - Elasticity limit at 2 %, - Tensile strength, - Elongation at break, - Vickers hardness, - Energy absorption (Charpy-V test) (if dynamically loaded), - Chemical composition.	ISO 1083
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	See Part 1, 5.1.7.1.1
Piece of aluminium alloy	On sampling: - Chemical composition, - Elasticity limit at 0,2 %, - Tensile strength, - Elongation at break.	EN 1676 and/or EN 573-3
Bolts, nuts and washers	According to the relevant EN standard or specification. Corrosion protection	E.g.: EN ISO 1461
Elements of anchorage (anchor bar, grout, resin, ...)	According to the relevant EN standard or specification.	
Reinforcement	According to the relevant EN standard or specification.	E.g. EN 10080
Ready mixed concrete for transition strip which are part of the product (see Annex 4-M, § 1.3)	According to the relevant EN standard or specification.	E.g. EN 206-1
Resin mortar for transition strip and cement mortar for transition strip	According to the manufacturer's specification, define e.g.:	
	Resin - Elongation at break, - Compressive strength, - Modulus of elasticity.	
	Aggregate and fillers: - Type, - Grading, <sup>2</sup> - Resistance to fragmentation, - Polished Stone Value (PSV).	EN 1097-2 EN 1097-8
Mortar: - Compressive strength.		
The finished product or its components shall be checked in a final inspection at the factory	Conformity to the specification drawings e.g. preset, corrosion protection, correct elements, dimensions, ....	

## 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).

### 6.0 TABLE LINKING THE ESSENTIAL REQUIREMENTS TO PRODUCT REQUIREMENTS

ER	Characteristics specified in the mandate	ETAG paragraph on product performance to be assessed	Class, use category, criterion		No performance determined option
1	Mechanical resistance	6.1.1.2	Carriageway	Pass/Fail	No
			and/or Footpath	Pass/Fail	No
			and/or options: - Accidental load on footway	Pass/Fail	No
			- Collision on kerb	Pass/Fail	No
	Resistance to fatigue	6.1.1.3	Pass/Fail		No
	Seismic behaviour	6.1.1.4	Declaration of selected approach and relevant information (aspects, etc.)		Yes
	Movement capacity	6.1.1.5	Declared value		No
	Cleanability	6.1.1.6	Pass/Fail		Yes
Resistance to wear	6.1.1.7	Not relevant			
Watertightness	6.1.1.8	Pass/Fail		Yes	
2	Not relevant				
3	Release of dangerous substances	6.1.3	Indication of dangerous substances incl. concentration, etc. or : "No dangerous substances"		Yes
4	Allowable surface gaps and voids.	6.1.4.1.1	Gap		Yes
			For vehicle	Pass/Fail	
			Gap for use in longitudinal axis	Pass/Fail	Yes
			Gap/recess		
		6.1.4.1.2	Level differences and steps		Yes
			Level differences and steps under loaded condition		Yes
	Skid resistance	6.1.4.2	On carriageway	Declared value if relevant	Yes
			On footpath	Declared value if relevant	Yes
Drainage capacity	6.1.4.3	Pass/Fail		Yes	
5	Not relevant				
6	Not relevant				
7	Durability of the characteristics against: Corrosion, ageing, chemicals, temperature, freeze-thaw, ozone	6.1.7	Corrosion	Pass/Fail	No
			Chemicals	Pass/Fail	No
			Ageing resulting from: - Temperature	Pass/Fail	No
			- Ozone	Pass/Fail	No
			Resistance against from freeze-thaw	Pass/Fail	No



## **6.1 KITS**

### **6.1.1 Mechanical resistance and stability**

#### **6.1.1.1 General**

#### **6.1.1.2 Mechanical resistance**

The product will be judged as fit for purpose for the designated use categories given in 2.2.1, provided that it satisfies the performance requirements in 4.1.1.2 by the verification procedure as described in 5.1.1.2.

#### **6.1.1.3 Resistance to fatigue**

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

#### **6.1.1.4 Seismic behaviour**

The selected approach in accordance with 4.1.1.4 and the relevant indications as in Table 4.1.1.4 shall be declared and stated in the ETA. The verification shall be in accordance with 5.1.1.4.

#### **6.1.1.5 Movement capacity**

The results of the verification of the declared value according to the verification method given in 5.1.1.5, including clearance, for the concerned directions shall be stated in the ETA. The reaction forces shall be stated in the ETA. The minimum opening shall be stated in the ETA.

#### **6.1.1.6 Cleanability**

Assessment shall be undertaken only on the basis of analysis of the design. The product will be judged as fit for use provided that the geometry of the expansion joint demonstrates ability to extrude debris by movement, using the verification procedure as described in 5.1.1.6.

The verification of the influence by joint opening and/or accumulation of debris in accordance with 4.1.1.6 shall be stated in the ETA. The verification shall be in accordance with 5.1.1.6.

#### **6.1.1.7 Resistance to wear**

Not relevant for this family product.

#### **6.1.1.8 Watertightness**

The assessment, of whether the assembled kit remains watertight, shall be undertaken according to the verification method given in 5.1.1.8.

If watertightness is achieved by a sub-surface drainage system this shall be addressed, including assessment of passage of water and durability of the material of the drainage system.

If the Expansion Joint includes a connection between the joint and the waterproofing of the main structure, this connection shall be assessed with a pass/fail criterion.

### **6.1.2 Safety in case of fire**

According to Part 1 of this ETAG 032: not relevant.

## **6.1.3 Hygiene, health and environment (ER 3)**

### **6.1.3.1 Release of dangerous substances**

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

The expansion joint and/or constituents of the expansion joint listed in the EOTA TR 034: "General Checklist for ETAGs/CUAPs/ETAs -Content and/or release of dangerous substances in products/kits", which have to be considered will be verified by the given methods taking into account the installation conditions of the construction product and the release scenarios resulting from there. Regulations related to placing the product on the market may also need to be taken into account.

Regarding the release scenarios referred to in the EOTA TR 034, the use category S/W2 (Product with no direct contact to but possible impact on soil, ground and surface water have to be considered

## **6.1.4 Safety in use**

### **6.1.4.1 Ability to bridge gaps and levels in the running surface**

#### *6.1.4.1.1 Allowable surface gaps and voids*

The expansion joint will be judged as fit for purpose provided that it satisfies the performance requirements in 4.1.4.1.1 by means of passing the verification procedure as described in 5.1.4.1.1.

The ETA shall state the maximum angle  $\beta$  (relative to the traffic direction) related to the concerned user category.

#### *6.1.4.1.2 Level differences in the running surface*

Assessment for the unloaded condition shall be undertaken on the bases of analysis of the technical file and drawings. The maximum dimension of steps and the difference of the running surface levels shall be stated in the ETA.

Under loaded conditions, the maximum vertical deflection, according to the verification given in 5.1.4.1.2, shall be stated in the ETA.

### **6.1.4.2 Skid resistance**

Assessment shall be undertaken on of analysis of the design. If required, the PTV according to the verification method given in 5.1.4.2 shall be stated in the ETA.

### **6.1.4.3 Drainage capacity**

Assessment shall be undertaken on the basis of analysis of the design according to 5.1.4.3.

## **6.1.5 Protection against noise**

According to Part 1 of this ETAG 032: not relevant.

## **6.1.6 Energy economy and heat retention**

According to Part 1 of this ETAG 032: not relevant.

## **6.1.7 Aspects of durability, serviceability and identification of the products**

### 6.1.7.1 Aspects of durability

#### 6.1.7.1.1 Corrosion

Assessment shall be undertaken on the basis of analysis of the Technical File according to 5.1.7.1.

#### 6.1.7.1.2 Chemicals

Assessment shall be undertaken on the basis of 5.1.7.1.

#### 6.1.7.1.3 Ageing resulting from temperature, UV radiation and ozone

For elastomeric sealing element which are susceptible to temperature and ozone degradation.

##### a) Ageing resulting from temperature

The assessment shall be undertaken according to the verification method given in 5.1.7.1. After the test, the change in hardness and in tensile properties shall fulfill the requirements given in the following table.

Table 6.1.7.1.3a: Requirements on hardness

	Maximum of variation
Shore hardness	+ 7 points
Tensile strength	-15 %
Elongation at break	-25 %

These values apply for all working life categories.

##### b) Ageing resulting from UV Radiation

Not relevant for this family Part.

##### c) Ageing resulting from ozone

The assessment shall be undertaken according to the verification method given in Table 5.2 for elastomer piece.

After the test, no visible cracks shall be observed.

#### 6.1.7.1.4 Resistance against from freeze-thaw

The assessment shall be undertaken according to the verification method given in 5.1.7.1. After the test, no degradation shall be observed.

### 6.1.7.2 Aspects of serviceability

The assessment shall be undertaken according to the verification method given in 5.1.7.2.

### 6.1.7.3 Aspects of identification of the product

The assessment shall be undertaken according to the 5.1.7.3.

## 6.2 COMPONENTS

The Approval Body shall assess the possible effects on the performance of the expansion joint due to the variability of the elements and materials characteristics and, where applicable, declared tolerances.

Table 6.2 below presents assessment criteria for materials for the components, defined in 4.2. For component materials not covered in the table below, appropriate assessment criteria shall be used.

The Approval Body shall assess the fitness for purpose of the components based on the manufacturer's stated values.

Related tolerances shall be declared by the manufacturer and shall be assessed by the Approval Body in respect to possible effects on the performance of the product/kit.

Table 6.2: Assessment criteria for component materials

Material/component	Characteristics	Specification*
Elastomer	On sampling:	
	- Density,	MDV
	- Hardness IRHD,	MDV with tolerance: $\pm 5$
	- Tensile strength,	$\geq$ MDV
	- Elongation at break,	$\geq$ MDV
	- Tear resistance,	MDV
	- Thermo gravimetric analysis (TGA), - Compression set.	Only for ITT** According to ISO 815-1: 24 h and 70 °C constant deflection 25 %
Steel pieces	On sampling: - Elasticity limit $f_{0,2k}$ at 0,2 %, - Tensile strength, - Elongation at break, - Energy absorption (Charpy-V test) (if dynamically loaded), - Chemical composition.	MDV
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	MDV
Piece in cast iron and/or cast steel	On sampling and where relevant: - Elasticity limit at 2 %, - Tensile strength, - Elongation at break, - hardness Vickers, - Energy absorption (Charpy-V test) (if dynamically loaded), - Chemical composition.	MDV
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	MDV
Piece of aluminium alloy	On sampling: - Chemical composition, - Elasticity limit at 0,2 %, - Tensile strength, - Elongation at break.	MDV
Bolts, nuts and washers	According to the relevant EN standard or specification.	MDV
	Corrosion protection	MDV
Elements of anchorage (anchor bar, grout, resin, ...)	According to the relevant EN standard or specification.	MDV
Reinforcement	According to the relevant EN standard or specification.	MDV
Ready mixed concrete for transition strip which are part of the product (see Annex 4-M, 1.3)	According to the relevant EN standard or specification.	MDV
Resin mortar for transition strip and cement mortar for transition strip	According to the manufacturer's specification, define e.g.:	
	Resin: - Elongation at break, - Compressive strength, - Modulus of elasticity.	MDV
	Aggregate and fillers: - Type, - Grading, - Resistance to fragmentation, - Polished Stone Value (PSV).	MDV
	Mortar: Compressive strength.	MDV
The finished product shall be checked in a final inspection at the factory	Conformity to the specification drawings e.g. preset, corrosion protection, correct elements, dimensions, ....	MDV

\* MDV (Manufacturer Declared Value) with acceptable tolerances.

\*\* Comment: For identification purposes, in case of failure of the product.

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

See Part 1 of this ETAG N° 032.

## **Section three: ATTESTATION OF CONFORMITY (AC)**

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### **8. ATTESTATION AND EVALUATION OF CONFORMITY**

#### **8.1 EC DECISION**

See Part 1 of this ETAG N° 032.

#### **8.2 RESPONSIBILITIES**

See Part 1 of this ETAG N° 032 and Table 8.3 below and the following additional amendments.

##### *8.2.1.1.2 Control of incoming products and materials*

See Part 1 of this ETAG N° 032. For rubber components, the test results shall be reported by a certificate in analogy with EN 10204, type 2.2.

##### **8.2.2.2 Initial Type-Testing**

See Part 1 of this ETAG N° 032. For components the characteristics according to Table 8.3 apply.

#### **8.3 DOCUMENTATION**

See Part 1 of this ETAG N° 032.

##### **(1) The ETA**

See Part 1 of this ETAG N° 032.

##### **(2) Basic manufacturing process**

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

The FPC shall be proposed by the manufacturer, this shall cover all aspects of materials, fabrication and assembly processes (e.g. welding).

##### **(3) Product and materials specifications**

See Part 1 of this ETAG N° 032.

##### **(4) Test plan (as part of FPC)**

The manufacturer and the Approval Body issuing the ETA shall agree an FPC test plan (with accepted tolerances).

An agreed FPC test plan is necessary as current standards relating to quality management systems (Guidance Paper B, EN ISO 9002, 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.

An example of frequency of routine tests according to Table 8.3 below is given.

*Table 8.3: Factory Production Control  
Example of frequency of control for components*

<b>Material/component</b>	<b>Characteristics</b>	<b>Test method(s)</b>	<b>Frequency</b>
Elastomer piece	On sampling:		Each lot, or certificate
	- Density,	According to ISO 2781 Technical corrections 1 (1996)	
	- Hardness IRHD,	According to ISO 48 or ISO 7619-2	
	- Tensile strength,	According to ISO 37	
	- Elongation at break,	According to ISO 37	Every three months
	- Tear resistance,	According to ISO 34-1 Method A	Once per year
	- Compression set.	According to ISO 815-1 24 h and 70 °C constant deflection 25 %	
Steel pieces	On sampling: - Elasticity limit $f_{0,2k}$ at 0,2 %, - Tensile strength, - Elongation at break, - Energy absorption (Charpy V test) (if dynamically loaded), - Chemical composition.	EN 10025, EN 10088	Certificate type 3.1 according to EN 10204 at each delivery. For secondary elements, certificate type 2.2 according to EN 10204, at each delivery
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	See Part 1, 5.1.7.1.1	Each batch or every assembled expansion joint
Piece in cast iron and/or cast steel	On sampling and where relevant: - Elasticity limit at 2 %, - Tensile strength, - Elongation at break, - hardness Vickers, - Energy absorption (Charpy-V test) (if dynamically loaded), - Chemical composition.	ISO 1083	Certificate type 3.1 according to EN 10204, at each delivery  For secondary elements, certificate type 2.2 according to EN 10204, at each delivery
	Corrosion protection: - Verification of the thickness and the continuity of the layer, - Surface characteristics before corrosion protection application (roughness, cleanliness), - Drying time.	See Part 1, 5.1.7.1.1	Each batch or each assembled expansion joint
Piece of aluminium alloy	On sampling: - Chemical composition, - Elasticity limit at 0,2 %, - Tensile strength, - Elongation at break.	EN 1676 and/or EN 573	Certificate type 3.1 according to EN 10204, at each delivery  For secondary elements, certificate type 2.2 according to EN 10204, at each delivery
Bolts, nuts and washers	According to the relevant EN standard or specification.		CE marking or certificate type 3.1 according to EN 10204 at each delivery or confidence achieved by sufficient samples testing
	Corrosion protection	E.g. EN ISO 1461	Identified at each delivery
Elements of anchorage (anchor bar, grout, resin, ...)	According to the relevant EN standard or specification.		CE marking or certificate type 3.1 according to EN 10204 at each delivery or confidence achieved by sufficient samples testing. For secondary elements, certificate type 2.2 according to EN 10204, at each delivery.
Reinforcement	According to the relevant EN standard or specification.	EN 10080	Identification according to the standard at each delivery.
Ready mixed concrete for transition strip which are part of the product (see Annex 4-M, 1.3)	According to the relevant EN standard or specification.	EN 206-1.	Identification according to the standard at each delivery.



Table 8.3 (continued)

Material/component	Characteristics	Test method(s)	Frequency
Resin mortar for transition strip and cement mortar for transition strip	According to the manufacturer specification, define e.g.:		Frequencies shall be defined by the manufacturer in function of the quantity used and in order to guarantee a correct level of quality.
	Resin - Elongation at break, - Compressive strength, - Modulus of elasticity.		
	Aggregate and fillers: - Type, - Grading, - Resistance to fragmentation, - Polished Stone Value (PSV).	EN 1097-2 EN 1097-8	
	Mortar: Compressive strength.		
The finished product shall be checked in a final inspection at the factory	Conformity to the specification drawings e.g. preset, corrosion protection, correct elements, dimensions, ....		Each assembled product.

The manufacturer shall declare a value for each relevant component. For components not defined in this table, suitable specifications shall be defined and tested accordingly.

Equivalent testing methods may be used when accepted by Notified Product Certification Body.

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.

#### (5) Prescribed test plan

See Part 1 of this ETAG N° 032.

### 8.4 CE MARKING AND INFORMATION

See Part 1 of this ETAG N° 032.

## **Section four: ETA CONTENT**

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### **9. THE ETA CONTENT**

See Part 1 of this ETAG N° 032.

## **ANNEXES TO THIS ETAG FAMILY PART**

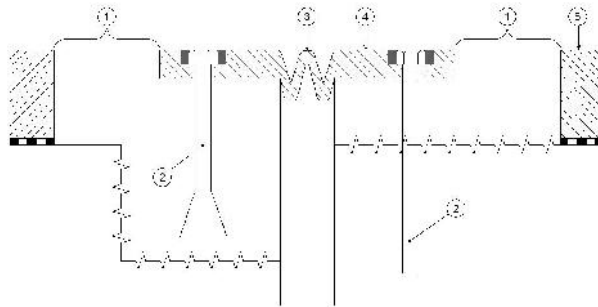
Annexes 4-A to 4-L for this family Part correspond to Annexes A – L in Part 1 of this ETAG N°032, if applicable.

## ANNEX 4-M

### DIFFERENT TYPES OF NOSING EXPANSION JOINT

**Note:** The purpose of this annex is to identify the different types of products which are covered by Part 4. The sketches are examples.

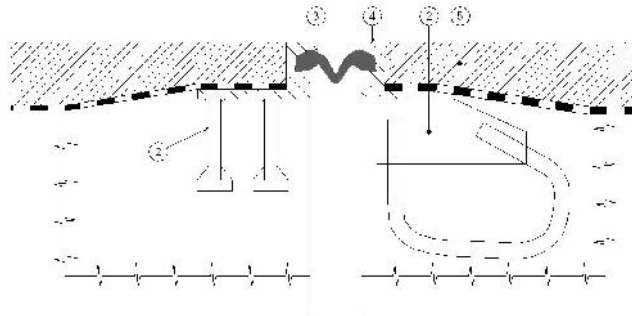
**Type 1 the sealing profile is held in place with anchorages**



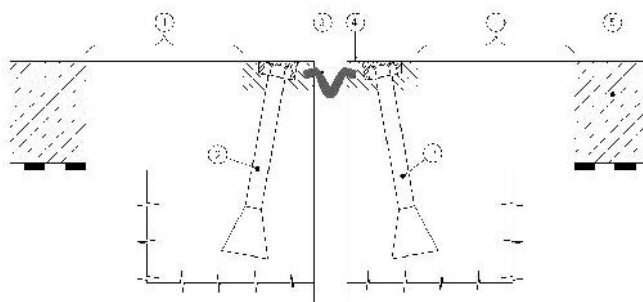
**Type 2 the sealing profile is held in place by clamping and/or adhesive or compression.** The clamp to maintain the sealing element is generally in metal but it is possible to have this clamp in resin mortar or other material.

In this sub family the connection to the structure is made by:

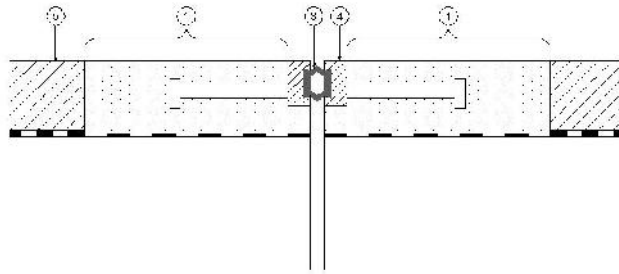
a) Reinforcement



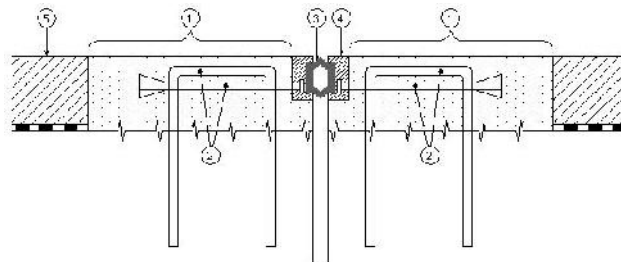
b) Screw and dowels or bolts



**c) Adhesion to the bridge deck concrete**



**d) A combination of adhesion to the bridge deck concrete completed by fastening of reinforcement into holes**



**Key**

**1 – Transition strip:** material between the expansion joint and the adjacent surfacing. Three types of transition strip can be distinguished:

1.1 – According to the method of installation of the product, the transition strip is made by a concrete beam connected to the structure and on which the expansion joint is applied. It is not supplied as part of the product (see Figure type 1 or 2b, for example).

1.2 – According to the method of installation of the product, the transition strip is a sealing product spread against the metal profile with the purpose of avoiding a crack between surfacing and expansion joint to reduce the risk of water penetration between the interface of the expansion joint and carriageway (see Figure type 2a).

1.3 – According to the design of the product, the transition strip is an intermediate beam on which the expansion joint is totally or partially connected and this beam is thereafter, connected to the structure. This transition material is part of the product (see Figure type 2c or 2d, for example).

For the two first examples, the type of transition strip is independent of the product and it is defined by the technical method of installation used in the Member State of installation of the joint.

**2 – Anchorage system:** Bars and rods that connect the expansion joint to the main structure or the abutment.

There are a lot of anchorage systems:

- With bolts, see Figures type 1 left, 2b or 2d low,
- With threaded rod connected to the structure in a hole filled by resin or adhesive material, see Figure type 1 top, right,
- With bars connected to the structure in a hole filled by resin or adhesive material, see Figures type 1 low, right, 2c, 2d top,
- With reinforcement. See Figures type 2a,
- Etc.

3 – **Seal part:** A flexible element which ensures the watertightness

This element is, generally, in rubber. It is moulded with the runner profile but more often it is engaged in a groove of the nosing profile. Sometimes it is only fixed with adhesive on the edge of the gap.

4 – **Edges.** Metal runners, concrete, resin mortar, elastomer, ....

The keys 1.3, 2, 3 and 4 are a part of the product.

5 – **Surfacing**

This is not covered by the product ETA.

# ANNEX 4-N

## VERIFICATION OF RESISTANCE TO FATIGUE

### FOREWORD

This annex gives a general approach of how to deal with fatigue of Nosing Expansion Joints and no detailed test methods are given.

The guidance given can also be used as the bases for fatigue verification of parts of the kit in combination with calculation.

### 4.N.1 – SCOPE

This annex is relevant for Nosing Expansion Joints. It describes the verification of resistance to fatigue by means of full scale laboratory testing.

This test also includes the verification of vertical deflection under static loading conditions.

### 4.N.2 – TERMS AND DEFINITIONS

For the purposes of this annex, terms and definitions given in 3.2 of the ETAG N° 032 Part 1 or in this Part 4 (particularly in Annex 4-M) and the following apply.

#### 4.N.2.1 Movement

Variation of the relative displacement between the parts of the structure supporting the expansion joint.

#### 4.N.2.2 Cycle

A cycle corresponds to a phase of one period of loading and unloading of the element tested.

### 4.N.3 – PRINCIPLE

The principle of this test procedure is to apply a simulation of the traffic loads. These conditions are considered to represent the design situations.

For this purpose, a suitable device applies an action effect representing the fatigue loads on a sample of the product. This device shall apply, with a number of cycles, a vertical force in conjunction with a horizontal force which is obtained by a resultant force with an appropriate angle.

The test is carried out in a laboratory on a standard section of Nosing Expansion Joints scale one to one.

In principle, one sample has to be tested. In case of unknown designs, more than one sample may be needed. This has to be agreed between the manufacturer, the Approval Body and the testing body based on the principles given in EN 1990.

The test is performed on an expansion joint kit. However, if no important interactions among the functions of the various elements occur, tests on a relevant part of the kit can be made using the same approach.

**Note:** In such case the actual behaviour of the expansion joint should be verified by means of calculations and data on the connections and interactions among the various elements.

One (or several) element(s) of an expansion joint is (are) installed on support beams with or without recess in conformity with the manufacturer's Installation Manual. These mobile blocks support allow the adjustment of the opening of the joint at the values defined for the test.

#### 4.N.4 – TRAFFIC LOADS AND NUMBER OF CYCLES

The test loads shall be derived from FLM1EJ and/or FLM2EJ for a contact pressure of 0,8 N/mm<sup>2</sup> and 1,0 N/mm<sup>2</sup> respectively, in accordance with Annex G, G3. According to this, the conditions in the Table 4.N.4 apply:

Table 4.N.4: Load cycles for verification of different fatigue lives in relation to the working life categories

Item		FLM 2 EJ				FLM 1 EJ
		10 years	15 years	25 years	50 years	Unlimited
Nosing Expansion Joints, including/respectively anchorage system (Contact pressure: 0,8 N/mm <sup>2</sup> )	n <sub>v+h</sub>	1,7 x 10 <sup>6</sup>	2,5 x 10 <sup>6</sup>	4,2 x 10 <sup>6</sup>	7,4 x 10 <sup>6</sup> (FLM 1 EJ applies)	7,4 x 10 <sup>6</sup>
	n <sub>v</sub>	1,1 x 10 <sup>6</sup>	1,7 x 10 <sup>6</sup>	2,9 x 10 <sup>6</sup>	--	--
Envelope (all cycles n <sub>v+h</sub> )	n	2,8 x 10 <sup>6</sup>	4,2 x 10 <sup>6</sup>	7,1 x 10 <sup>6</sup>	7,4 x 10 <sup>6</sup> (FLM 1 EJ applies)	
Nosing Expansion Joints, including/respectively anchorage system (Contact pressure: 1,0 N/mm <sup>2</sup> )	n <sub>v+h</sub>	0,87 x 10 <sup>6</sup>	1,3 x 10 <sup>6</sup>	2,2 x 10 <sup>6</sup>	3,8 x 10 <sup>6</sup> (FLM 1 EJ applies)	3,8 x 10 <sup>6</sup>
	n <sub>v</sub>	0,57 x 10 <sup>6</sup>	0,87 x 10 <sup>6</sup>	1,5 x 10 <sup>6</sup>	--	--
Envelope (all cycles n <sub>v+h</sub> )	n	1,44 x 10 <sup>6</sup>	2,17 x 10 <sup>6</sup>	3,7 x 10 <sup>6</sup>	3,8 x 10 <sup>6</sup> (FLM 1 EJ applies)	

#### Derivation of test loads from contact pressure:

The load application shall be executed by means of a contact area which simulates the geometry and stiffness of the wheel.

- Minimum vertical test load per wheel =  $A_{min} \times 0,8 = 300 \times 250 \times 0,8 = 60 \times 10^3 \text{ N} = 60 \text{ kN}$ .
- Corresponding horizontal test load per wheel =  $(0,2/1,3) \times 60 = 9,2 \text{ kN}$ .
- The partial factor  $F_{f} = 1,0$ .

**Note 1:** For simplification it is possible to replace n<sub>v</sub> by n<sub>v+h</sub>.

**Note 2:** For idealisation of axle load histogram to maximum axle loads with equivalent numbers of cycles m = 3 is used. Use of m = 3 is related to the situation that the load transferring components are made of steel.

**Note 3:** If horizontal loads can be neglected (see also 5.1.1 in this ETAG Part), the total numbers of vertical load cycles become: 2,8 (10 years category), 4,2 (15 years category) and 7,1 millions (25 years category) for contact pressure = 0,8 N/mm<sup>2</sup>. For 50 years category the total number of cycles related to FLM 1 applies.

**Note 4:** Theoretical contact pressure of 1,0 N/mm<sup>2</sup> can be further increased and the number of cycles can be reduced accordingly.

#### 4.N.5 – TESTING CONDITIONS

The test load shall be derived from 4.N.4 and distributed according to G1 and formula G1 in Part 1 of this ETAG N° 032. It shall be applied with an angle according to the vertical and horizontal load ratio given in Annex G of Part 1 in the direction of the expansion joint gap (see note in G3.3 in Part 1 of this ETAG N° 032).

The test is carried out under the following conditions:

- Test temperature:  
The ambient temperature during the test shall lie between +5 °C and +30 °C. These conditions cover all operating temperatures.
- Number of load cycles:  
The number of load cycles is determined according to the specified categories of working life (see 2.3.4 and 4.N.4 of this family Part).



- Positioning of the sample:  
The test shall be run at 60 % of the maximum opening position. The relative positioning of the travelling loads on the sample in the most unfavourable loading condition shall be agreed.
- Frequency:  
The frequency shall be equal or greater than 0,5 Hz.

#### **4.N.6 – EQUIPMENT**

The support of the test specimen shall simulate realistic support conditions, including anchorage.

The test rig shall be able to control the tolerance on the forces within deviations of  $\pm 5\%$  and shall include a suitable device for counting the number of cycles.

The test arrangement shall not influence the test result by resonance effects. A dynamic analysis of the test arrangement shall show that no resonance effects are to be expected.

The actuators shall be calibrated and the actuating system shall not cause inaccuracies in the measurements.

Devices for counting the number of cycles shall be adapted to the maximum frequency of the test while allowing the recording of the data of the test.

The measuring tolerances on load shall be  $\pm 1$  kN.

#### **4.N.7 – SAMPLE AND PREPARATION OF TEST**

The expansion joint kit to be tested consists of 1,2 m at least of a current section of the product and called sample. If relevant, it shall comprise at least one standard connection (butt joint). The exact length of the sample is fixed by agreement between the manufacturer, the Approval Body and the test laboratory according to the type of product in order to avoid cuts modifying the operating mode.

For testing of part of the kit (see 4.N.3), the same approach applies except the minimum length of 1,2 m.

The sample tested shall be in conformity with the manufacturing drawings and the specifications including the tolerances.

It shall be verified that the samples comply with the specifications.

The sample of the product to be tested shall be installed in the testing frame under the control of the manufacturer and shall comply with the installation procedure.

#### **4.N.8 – EXECUTION OF THE TEST**

##### **4.N.8.1 Test procedure**

a) Before the test operating:

- Check the fastenings of the joint, its opening and the level of its surface.
- Apply and check the maximum load and its direction using a calibrated device.

b) For the test, the load is applied by fully reversed cycles as define in 4.N.5).

c) During the test, at the stages corresponding to 10 000, 100 000 and every 500 000 load cycles and at the end of test:

- Record by visual inspection the behaviour of the joint.
- Record the appearance of any disorder (e.g. cracking of rubber, defect of fixing of the rubber profile in its groove, plastic deformations, failure of welding, ...).

#### **4.N.8.2 Verification of static deflection**

To verify level differences in the running surface (5.1.4.1.2), the test is carried out before fatigue test with the load on the expansion joint.

This test is done after the procedure described in 4.N.8.1a).

#### **4.N.9 – EXPRESSION OF RESULTS**

Displacements and the value of movement capacity are expressed in mm and forces are expressed in kN.

Information to be given will fit in one of the following proposals:

- 1) The product tested does not present any disorder, or minor disorders such as wear, ...,
- 2) The product tested presents major disorders such as failure, non-reversible deformation (greater than 0,5 mm in all direction), failure of welding, ...

The observation on the product after test shall be linked with requirements in Table 4.1.1 in Part 1 of this ETAG N° 032.

A precise localisation of the disorders as well as photographs and statements shall be attached to the report.

#### **4.N.10 – TEST REPORT**

##### **4.N.10.1 Test report for fatigue verification**

The test report shall refer to the present annex and mention:

- The origin of the expansion joint to be tested (the name of the manufacturer, the name of the production centre);
- The model identification (type, theoretical movement capacity, N° of batch);
- A reference to this annex and any deviation from it;
- Description of the test equipment, the consistency of the assessment with how the criteria and guidance of this annex are respected;
- The date of the preparation of specimens, the date of test and the test mean temperature;
- The statement of principal dimensions which allow for unique identification of the product tested;
- Observations on the behaviour corresponding to each stage, non-reversible deformation value which can be detected, ...;
- Test conditions and operational details not envisaged in this document as well as the possible incidents likely to have affected the results.

##### **4.N.10.2 Test report for verification of deformation under static load**

The test report shall refer to the present annex and mention:

- The origin of the expansion joint to be tested (the name of the manufacturer, the name of the production centre);
- The model identification (type, theoretical movement capacity, N° of batch);
- A reference to this annex and any deviation from it;
- Description of the test equipment;
- The date of the preparation of specimens, the date of test and the test mean temperature;
- The statement of principal dimensions which allow for unique identification of the product tested;
- Brief description of the test conditions;
- Value and location of the measurement;
- Test conditions and operational details not envisaged in this document as well as the possible incidents likely to have affected the results.