

EUROPEAN ASSESSMENT DOCUMENT

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**FACTORY MADE STRUCTURAL
ANCHOR FOR ATTACHING
PERSONAL FALL PROTECTION
EQUIPMENT, DESIGNED TO BE
PERMANENTLY AND FULLY
BONDED TO A MULTI-LAYERED
ROOF WATERPROOFING SYSTEM**

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) N° 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

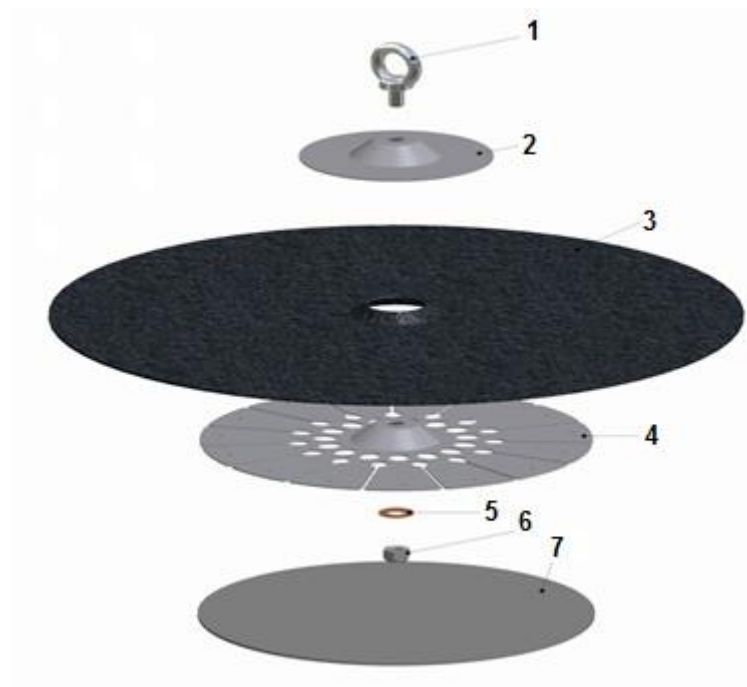
1.1 Description of the construction product

This EAD specifies factory made structural anchors for attaching personal fall protection equipment, designed to be permanently fully bonded by thermal welding to a multi-layered modified bituminous roof waterproofing system provided with polyester reinforcement to a maximum roof slope of 15°, without perforating the roof waterproofing system.

NOTE 1: This EAD covers the anchors, not the roof waterproofing system to which the anchors are intended to adhere. This does not mean that the EAD does not address the assessment demonstrating that the anchor adheres to the roof waterproofing system, but means that the resulting ETA solely applies to the structural anchor, not to the structural anchor and the sheet (s) making up the roof waterproofing system.

In accordance with Commission Implementing Decision (EU) 2015/2181¹, this product is not covered by a harmonised European standard.

As indicated in figure 1 the assembled structural anchor in principle consists of the following components.



Key:

1	Stainless steel anchor point	4	Stainless steel lower plate
2	Stainless steel upper plate	5 and 6	Stainless steel spring washer and lock nut
3	Flexible reinforced bituminous upper sheet	7	Flexible reinforced bituminous lower sheet

Figure 1 – Principle build-up of the assembled structural anchor

The lower flexible reinforced bituminous sheet of the structural anchor is intended to work as a filling layer. Its main function is to fill the space and avoid air entrapments between the structural anchor and the waterproofing sheets of the roof. This sheet does not contribute to the load bearing capacity of the anchor.

The upper flexible reinforced bituminous sheet of the structural anchor contributes to the load bearing capacity of the structural anchor and shall ensure a sufficient bond with the waterproofing system on the roof in order to enable the load transfer from the anchor onto the roof waterproofing system.

¹ OJ L309, 26.11.2015, p. 10

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

For new and existing roofs this shall be done by using the declared value of the longitudinal tensile strength as specified in the product data sheet of the reinforced bituminous sheets according to EN 13707. The values of the longitudinal tensile strength for the individual polyester reinforced bituminous sheets, as used in the multi-layered modified bituminous roof waterproofing system, shall be summed together to a total maximum tensile force of the roof waterproofing system. Values for bituminous sheets, reinforced with glass fibres only, shall not be added.

For existing roofs, the maximum tensile force of the multi-layered modified bituminous roof waterproofing system can also be determined by testing the maximum tensile force directly, according to EN 12311-1.

The thickness of the top layer of an existing roof waterproofing system bonded by thermal welding shall be at least 3,0 mm for non-granulated top layers and 3,5 mm for granulated top layers (total thickness) for top layers.

The thickness of the top layer of an existing roof waterproofing system bonded with hot bitumen shall be at least 2,0 mm for non-granulated top layers and 2,5 mm for granulated top layers (total thickness) for top layers.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The intended use of the factory made structural anchor is to attach personal fall protection equipment to form a fall arrest system or restraint system as defined respectively in clauses 3.2.1.1 and 3.2.1.4 of EN 363:2008. The ETA shall specify whether the system is intended to be used in fall arrest systems, in restraint systems or in both.

The ETA shall specify the manufacturer's end use conditions, e.g. the climatic conditions the system is appropriate for, in accordance with those given in paragraphs 2.2.3.1, 2.2.3.2 and 2.2.3.3 for fall arrest systems and in paragraphs 2.2.4.1 and 2.2.4.2 for restraint systems.

The structural anchor may be used on a new or an existing multi-layered modified bituminous roof waterproofing system, provided with a polyester reinforcement, with a required minimum value of the maximum tensile force (see 1.1), a required minimum thickness of the top layer (see 1.1) and to a maximum roof slope of 15 °.

According to EOTA TR 036, Annex A, Clause A.1, there are four methods of attaching a multi-layered modified bitumen roof waterproofing system to the deck/substructure:

- partially bonded (P)
- fully bonded (F)
- mechanically fastened (MF)
- loose laid and ballasted (L)

The ETA shall specify, taking into account the intended use, the manufacturer's methods of attaching a multi-layered modified bitumen roof waterproofing system to the deck/substructure that are applicable.

In case the full scale tests at high temperature are performed following to the worst case scenario approach according to EOTA TR 036, clause II.4, it shall be specified in the intended use of the ETA that the structural anchor is applicable for all methods of attaching of the multi-layered modified bitumen roof waterproofing system to the deck/substructure.

In case not all attaching methods are aimed to be covered by the ETA, the specific applicable attaching methods shall be specified in the “intended use” clause of the ETA.

Additionally, the following limitations shall be specified:

- for mechanically fastened roof waterproofing systems (MF): the minimum number of fasteners per m² to be applied;
- for partially or fully bonded (P or F): the minimum percentage of bonding surface.

The ETA shall specify the manufacturer’s minimum roof size surrounding the structural anchor in accordance to Annex A of this EAD. In case the intended use covers loose laid and ballasted roof waterproofing systems, the minimum roof size and the minimum mass of the ballast layer (kg/m²) as well as the type of ballast (i.e. gravel or concrete tiles) shall be specified in the ETA.

NOTE: The factory made structural anchor is not intended to be used for single-layered roof waterproofing systems

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer’s request to take into account a working life of the factory made structural anchors for the intended use of 10 years when installed in the works, provided that the factory made structural anchors are subject to appropriate installation (see 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works².

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

1.3.1 Anchor system

System intended for use as part of a personal protection system that incorporates an anchor point or points and/or an anchor device and/or an element and/or a fixing element and/or a structural anchor (see EN 795:2012, clause 3.1)

1.3.2 Structural Anchor

Element or elements which are designed for use in conjunction with a personal fall protection system and to be permanently incorporated into the structure (See EN 795:2012, clause 3.3)

NOTE 1: The structural anchor is not part of the anchor device

² The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

NOTE 2: An example of a structural anchor is where an element is welded or bonded by resin to the structure.

1.3.3 Anchor point

Point on an anchor system to which personal fall protection equipment is intended to be attached (see EN 795:2012, clause 3.6)

1.3.4 Personal fall protection system

Assembly of components intended to protect the user against falls from a height, including a body holding device and an attachment system, which can be connected to a reliable anchor point (see EN 363:2008, clause 3.2.1)

NOTE 1: Excludes systems for professional and private sports activities.

NOTE 2: The attachment system may include an anchor device.

NOTE 3: A body holding device may be, for example, a full body harness, work positioning belt, rescue harness, rescue loop.

1.3.5 Fall arrest system

Personal fall protection system which limits the impact force on the body of the user during a fall arrest (see EN 363:2008, clause 3.2.1.4)

1.3.6 Restraint system

Personal fall protection system which prevents the user from reaching zones where the risk of a fall from a height exist (see EN 363:2008, clause 3.2.1.1)

1.3.7 Single-layered roof waterproofing system

Roof waterproofing system in which the watertight layer is constituted by one only sheet, which, in both the general area of the roof and in upstands, fulfils all the functional and durability requirements

1.3.8 Multi-layered roof waterproofing system

Roof waterproofing system in which the watertight layer is constituted by more than one sheet, at least two.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of factory made structural anchors is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and assessment methods and criteria for the performance of the product in relation to those essential characteristics

N°	Essential characteristic	Assessment method	Expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class according to Commission Delegated Regulation (EU) N° 2016/364
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content and/or release of dangerous substances	2.2.2	See 2.2.2
Basic Works Requirement 4: Safety in use			
3	Strength of the assembly of steel components of the structural anchor	2.2.3	Level
4	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a fall arrest system	2.2.4	Level
5	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a restraint system	2.2.5	Level
6	Minimum roof size	2.2.6	Level
7	Properties of the anchor point, plates, spring washer and lock nut	2.2.7	Level
8	Characteristics of assembly components	2.2.8	Level
Note: In this EAD the essential characteristic “external fire performance” of the bituminous upper and lower sheet being a component of the structural anchor has not been addressed. This EAD covers the structural anchor, not the roof build-up. The essential characteristic “external fire performance” is dominated by the roof build-up (see EN 13707, clause 5.2.5.1) and not by a single bitumen sheet with a limited area.			

To facilitate the expression of different performances of the product with regard to combinations of essential characteristics referred to in Table 1 distinction is made between the following use categories:

- fall arrest systems
- restraint system

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

2.2.1 Reaction to fire

All components of the structural anchor to be used on a multi-layered modified bituminous roof waterproofing system shall be tested according to EN 13501-1, in order to be classified according to Commission Delegated Regulation (EU) N° 2016/364.

2.2.2 Content, emission and/or release of dangerous substances - Leachable substances

The performance of the product (components of the system) related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer³ after identifying the release scenarios (in accordance with EOTA TR 034) taking into account the intended use of the product and the Member State where the manufacturer intends his product to be made available on the market.

The identified intended release scenarios for the product and intended use with respect to dangerous substances are: S/W2: Product with indirect contact to soil, ground- and surface water.

For the intended use covered by the release scenario S/W2 the performance of the product concerning leachable substances has to be assessed, if the product contains agents for root penetration. A leaching test with subsequent eluate analysis must take place, each in duplicate. Leaching tests of the sheet contained agents for root penetration are conducted according to CEN/TS 16637-2:2014. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area shall be $(20 \pm 5) \text{ l/m}^2$.

A sandblasted glass plates coated with the sheet (maximal thickness according to the technical data sheet) shall be prepared. The edges are not sealed. The cut edges of the sheet strip exposed to the eluent should be included in the calculation as a leachable area.

The eluates taken after 6 hours / 1 day / 2 days and 6 hours / 4 days / 9 days / 16 days / 36 days / 64 days shall be analysed for all environmentally relevant parameters, presumably at least the following:

- TOC according to EN 1484,
- pH-value according to EN ISO 10523,
- electrical conductivity according to EN 27888,
- agents for root penetration concentration ($\mu\text{g/L}$), agents for root penetration release [$\mu\text{g/m}^2$] and the cumulative agents for root penetration release (g/m^2) according to appropriate test method

In eluates of "6 hours" and "64 days", the following biological tests shall be conducted:

- Acute toxicity test with *Daphnia magna* Straus according to EN ISO 6341
- Toxicity test with algae according to ISO 15799
- Luminescent bacteria test according to EN ISO 11348-1, EN ISO 11348-2 or EN ISO 11348-3

For each biological test, EC20-values shall be determined for dilution ratios 1:2, 1:4, 1:6, 1:8 and 1:16.

If the parameter TOC is higher than 10 mg/l, the following biological tests shall be conducted with the eluates of "6 hours" and "64 days" eluates: Biological degradation according to OECD Test Guideline 301 part A, B or E.

Determined toxicity in biological tests shall be expressed as EC20-values for each dilution ratio. Maximum determined biological degradability shall be expressed as "...% within ...hours/days". The respective test methods for analysis shall be specified.

2.2.3 Strength of the assembly of steel components of the structural anchor

The strength of the assembly of steel components of the structural anchor shall be assessed in accordance with the procedure as detailed in EOTA TR 036, clause I, by the deformation test (clause I.4.2), the dynamic strength test (clause I.4.3) followed by a static strength test (clause I.4.3.4).

³ The manufacturer may be asked to provide to the TAB the REACH related information which he must accompany the DoP with (cf. Article 6(5) of Regulation (EU) No 305/2011). The manufacturer is **not** obliged:

- to provide chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
 - to provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS.
- Any information provided by the manufacturer regarding the chemical composition of the products may not be distributed to EOTA or to TABs.

The strength of the assembly of steel components of the structural anchor shall be specified in the ETA:

- 1 After the deformation test the permanent deformation shall be specified.
- 2 For the dynamic strength for respectively single-user or multi-user (with the number of users), the highest peak force shall be specified and whether or not the rigid test mass has been arrested.
- 3 Based on the static test following the dynamic test for respectively single-user or multi-user (with the number of users), the ETA shall specify whether the assembly holds the force for 3 minutes.

EN 795:2012 demands that no part of the anchor, intended to deform, shall demonstrate permanent deformation of more than 10 mm in the direction of loading after being tested in accordance with clause 5.3.2 of that standard.

2.2.4 Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a fall arrest system

2.2.4.1 Small scale testing before and after thermal ageing

The strength of the structural anchor on a multi-layered modified bituminous roof waterproofing system before and after thermal ageing shall be assessed by small scale testing in accordance with EOTA TR 036, clause II.2.

The test specimen consists of a top layer of a multi-layered modified bituminous roof waterproofing system according to EOTA TR 036, clause II.2.2, on which the structural anchor is adhered.

On the test specimen the following properties are determined:

- 1 The maximum static force, $F_{s,m}$, expressed in kN, of the unaged test specimen, in accordance with EOTA TR 036, clause II.2.4.2;
- 2 The change in the maximum static force, $\Delta s,1$ in %, after ageing of the top layer of the multi-layered modified bituminous roof waterproofing sheet, in accordance with EOTA TR 036, clause II.2.4.4.1.
- 3 The change in the maximum static force, $\Delta s,2$ in %, after ageing of the combination of the structural anchor and the top layer of the multi-layered modified bituminous roof waterproofing sheet, in accordance with EOTA TR 036, clause II.2.4.4.2.

In the ETA, the following shall be specified:

- 1 The maximum static force $F_{s,m}$, expressed in kN, of the unaged test specimen;
- 2 The change in the maximum static force $\Delta s,1$ in %, after ageing of the top layer of the multi-layered modified bituminous roof waterproofing sheet.
The maximum static force $\Delta s,1$ shall not be less than 80 % of the initial value;
- 3 The change in the maximum static force $\Delta s,2$ in %, after ageing of the combination of the structural anchor and the top layer of the multi-layered modified bituminous roof waterproofing sheet.
The maximum static force $\Delta s,2$ shall not be less than 80 % of the initial value.

NOTE: The maximum reduction of the maximum static force of 20% is adopted from ETAG 006, clause 6.2.7. In divergence of ETAG 006, it is the static force, which is assessed.

2.2.4.2 Small scale testing at low temperature

The dynamic strength of the structural anchor on a multi-layered modified bituminous roof waterproofing system at low temperature and whether the fall has been arrested shall be assessed by small scale testing in accordance with EOTA TR 036, clause II.3.

The test specimen consists of a top layer of a multi-layered modified bituminous roof waterproofing system on which the structural anchor is adhered.

The top layer of the roof waterproofing system is equal to the top layer as used in the test specimen as required in clause 2.2.4.1 of this EAD.

On the test specimen at the chosen category of low temperature, TLFA (low temperature at fall arrest, expressed in °C), the dynamic strength shall be determined in accordance with EOTA TR 036, clause II.3.4.2.

The low temperature categories (TL) are:

- Moderate low temperature - 10 °C
- Severe low temperature - 20 °C
- Extreme low temperature - 30 °C

NOTE 1: The categorisation of low temperature TL is derived from ETAG 005, Part 1, Table 6(a).

NOTE 2: The category TL - 30 °C (Extreme low temperature) shall only be assessed when required in the member state where the product is intended to be used

NOTE 3: Provided that these are specified in the ETA, assessment may take place at other temperatures, but those specified are recommended.

The dynamic strength of the structural anchor on a multi-layered modified bituminous roof waterproofing system at the low temperature category at fall arrest, TLFA, shall be specified in the ETA.

The ETA shall further specify whether the rigid test mass is arrested.

2.2.4.3 Full scale testing at high temperature

The effect of a load on the structural anchor on the strength of the multi-layered modified bituminous roof waterproofing system at high temperature shall be assessed on a large test specimen on a complete roof build-up using the combination of the structural anchor adhered to the multi-layered bituminous roof waterproofing system by full scale testing in accordance with EOTA TR 036, clause II.4.

The maximum tensile force of the multi-layered modified bituminous roof waterproofing system shall be determined by testing according to EN 12311-1.

The top layer of the roof waterproofing system shall be chosen in accordance with EOTA TR 036, II.4.2.

In order to be representative for all methods of attaching of the multi-layered modified bituminous roof waterproofing systems to the deck/substructure, as defined in accordance with EOTA TR 036, clause A.1, the two most critical methods of attaching are tested.

The test specimen shall be either:

- A structural anchor adhered on a roof with a loose laid multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- A structural anchor adhered on a roof with a mechanically fastened multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.2, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.

In addition, or as an alternative in case not all attaching methods are intended to be covered by the ETA, the assessment of the effect of a load on the structural anchor on the strength of the multi-layered modified bituminous roof waterproofing system using a specific intermediate attaching method, may also be assessed on individual test specimens.

These test specimens shall be one of the following:

- For loose laid and ballasted roof waterproofing systems: A structural anchor adhered on a roof with a loose laid and ballasted multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- For mechanically fastened roof waterproofing systems: A structural anchor adhered on a roof with a mechanically fastened multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.2, but with a specified minimum number of fasteners per m² and with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- For partially and fully bonded roof waterproofing systems: A structural anchor adhered on a roof with a specific partially or fully bonded multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with a specified minimum percentage of bonding surface and with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.

On the test specimen at the chosen category of high temperature, THFA (high temperature at fall arrest, expressed in °C), a dynamic strength test shall be performed in accordance with EOTA TR 036, clause II.4.4.3.

On the test specimen at the chosen category of high temperature, THFA (high temperature at fall arrest, expressed in °C), a static strength test shall be performed with a static test force F_s for each user, in accordance with EOTA TR 036, clause II.4.4.2.

The high temperature (TH) categories are:

- Moderate high temperature 60 °C or 80 °C
- Extreme high temperature 90 °C

NOTE 1: The categorisation of high temperature TH is derived from ETAG 005, Part 1, Table 6(b).

NOTE 2: The category TH 90 °C (extreme high temperature) is indicated for southern European regions considered as having “severe” climatic conditions related to high surface temperatures (area south of indicative “isoline 5” - see map of EOTA TR 010, Annex C).

The category TH 90 °C (extreme high temperature) shall only be assessed when required in the member state where the product is intended to be used.

NOTE 3: Provided that these are specified in the ETA, assessment may take place at other temperatures, but those specified are recommended.

The chosen high temperature at fall arrest, THFA, shall be specified in the ETA.

The maximum tensile force of the multi-layered modified bituminous roof waterproofing system shall be specified in the ETA as the minimum value of the maximum tensile force of the multi-layered modified bituminous roof waterproofing system.

The admissible attaching method(s) of the multi-layered bituminous roof waterproofing system on which the structural anchor may be used, shall be specified in the ETA.

Based on the dynamic strength test, the ETA shall specify whether the rigid mass is arrested.

Based on the static strength at a static test force, F_s , the ETA shall specify whether the structural anchor holds the force.

2.2.5 Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a restraint system

2.2.5.1 Small scale testing at low temperature

The dynamic strength of the structural anchor on a multi-layered modified bituminous roof waterproofing system at low temperature and whether the fall has been arrested shall be assessed by small scale testing in accordance with EOTA TR 036, clause II.3.

The test specimen for the testing at low temperature shall be a “small scale” test specimen in accordance with EOTA TR 036, clause II.2.2.

On the test specimen the dynamic strength at the chosen category of low temperature at restraint, TLR, shall be determined in accordance with EOTA TR 036, clause II.3.4.2.

The low temperature Categories (TL) are:

- Moderate low temperature - 10 °C
- Severe low temperature - 20 °C
- Extreme low temperature - 30 °C

NOTE 1: The categorisation of low temperature TL is derived from ETAG 005, Part 1, Table 6(a).

NOTE 2: The category TL - 30 °C (extreme low temperature) shall only be assessed when required in the member state where the product is intended to be used.

NOTE 3: Provided that these are specified in the ETA, assessment may take place at other temperatures, but those specified are recommended.

The dynamic strength of the structural anchor on a multi-layered modified bituminous roof waterproofing system at the low temperature category restraint, TLR, shall be specified in the ETA.

The ETA shall further specify whether the rigid test mass is arrested.

2.2.5.2 Full scale testing at high temperature

The strength of the structural anchor to be used as a restraint system on a multi-layered modified bituminous roof waterproofing system at high temperature shall be assessed by a full scale dynamic testing on a large test specimen on a complete roof build-up using the combination of the structural anchor adhered to the selected multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause III.

In order to be representative for all methods of attaching of the multi-layered modified bituminous roof waterproofing systems to the deck/substructure, as defined in accordance with EOTA TR 036, clause A.1, the two most critical methods of attaching are tested.

The test specimen for the testing at a high temperature shall be either:

- A structural anchor adhered on a roof with a loose laid multi-layered bituminous waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- A structural anchor adhered on a roof with a mechanically fastened multi-layered bituminous waterproofing system in accordance with EOTA TR 036, clause II.4.2.2, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.

In addition, or as an alternative, in case not all attaching methods are aimed to be covered by the ETA, the assessment of the effect of a load on the structural anchor on the strength of the multi-layered modified bituminous roof waterproofing system using a specific intermediate attaching method, may also be assessed on individual test specimens.

These test specimens shall be one of the following:

- For loose laid and ballasted roof waterproofing systems: A structural anchor adhered on a roof with a loose laid and ballasted multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- For mechanically fastened roof waterproofing systems: A structural anchor adhered on a roof with a mechanically fastened multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.2, but with a specified minimum number of fasteners per m² and with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.
- For partially and fully bonded roof waterproofing systems: A structural anchor adhered on a roof with a specific partially or fully bonded multi-layered bituminous roof waterproofing system in accordance with EOTA TR 036, clause II.4.2.1, with a specified minimum percentage of bonding surface and with the position of the joints in accordance with EOTA TR 036, clause II.4.2.3.

On the test specimen the dynamic strength at the chosen category of high temperature, THR, shall be determined in accordance with EOTA TR 036, clause III.4.2.

The high temperature (TH) categories are:

- Moderate high temperature 60 °C or 80 °C
- Extreme high temperature 90 °C

NOTE 1: The categorisation of high temperature TH is derived from ETAG 005, Part 1, Table 6(b).

NOTE 2: The category TH 90 °C (extreme high temperature) is indicated for southern European regions considered as having “severe” climatic conditions related to high surface temperatures (area south of indicative “isoline 5”- see map of EOTA TR 010, Annex C).

The category TH 90 °C (extreme high temperature) shall only be assessed when required in the member state where the product is intended to be used.

NOTE 3: Provided that these are specified in the ETA, assessment may take place at other temperatures, but those specified are recommended.

The strength of the structural anchor to be used as a restraint system at the chosen category of high temperature restraint, THR, on the multi-layered modified bituminous roof waterproofing system shall be specified in the ETA.

The admissible attaching method(s) of the multi-layered bituminous roof waterproofing system on which the structural anchor may be used, shall be specified in the ETA.

The ETA shall specify whether the rigid test mass is arrested.

2.2.6 Minimum roof size

To avoid that the roof waterproofing system slides down, the minimum roof size shall be determined in accordance to the method given in Annex A of this EAD.

The chosen roof size shall be assessed by analysis of the assumptions, test results and calculations in accordance to Annex A of this EAD. If relevant for the construction the assumptions shall be given in the ETA.

2.2.7 Properties of the anchor point, plates, spring washer and lock nut

The following characteristics shall be verified.

- The type and dimensions of the anchor point, plates, spring washer and lock nut with the manufacturers drawings;
- The type of steel, as indicated, shall be verified in accordance with EN 10088-1. The type of steel as designated in clause 4 of EN ISO 3506-1 shall be type A4 for exposed components such as the anchor point and upper plate and shall be type A2 or A4 for the non-exposed components.

2.2.8 Characteristics of assembly components

2.2.8.1 General

Apart from the anchor point, plates, spring washer and lock nut of stainless steel, the assembled structural anchor comprises flexible reinforced bituminous sheets that shall meet the minimum requirements specified in this clause.

Within the scope of this EAD, the flexible reinforced bituminous sheets that are used to attach the structural anchor to the reinforced bituminous waterproofing system are not to be fully assessed as roof waterproofing sheets according to EN 13707, since their intended use is different from the intended use as defined in that standard. In clauses 2.2.8.2 and 2.2.8.3 only those characteristics are addressed that are relevant to the intended use of the flexible reinforced bituminous sheets to attach the structural anchor to the roof waterproofing system.

2.2.8.2 Requirements for the flexible reinforced bituminous upper sheet

The following characteristics shall be verified on “unaged” test samples:

1. Dimensions
 - a. Diameter
The diameter shall be measured using a measuring tape or rule of length greater than the diameter of the bitumen sheet to be measured, permitting the measurement to be made to the nearest 1 mm.
 - b. Thickness
The thickness shall be measured in accordance with EN 1849-1.
2. Visible defects in accordance with EN 1850-1
3. Reaction to fire in accordance with the provisions given in clause 5.2.5.2 of EN 13707
4. Shear resistance of joints in accordance with EN 12317-1
5. Tensile properties in accordance with EN 12311-1
6. Resistance to tearing (nail shank) in accordance with EN 12310-1
7. Flexibility at low temperature (pliability) in accordance with EN 1109
8. Flow Resistance at elevated temperature in accordance with EN 1110

The following characteristics shall be verified on “aged” test samples:

9. Visible defects in accordance with EN 1850-1
10. Flexibility at low temperature (pliability) in accordance with EN 1109
11. Flow Resistance at elevated temperature in accordance with EN 1110

The artificial heat ageing procedure shall be in accordance with the procedures as detailed in EN 1296 for an exposure time of 12 weeks at a temperature of (70 ± 2) °C.

2.2.8.3 Requirements for the flexible reinforced bituminous lower sheet

The following characteristics shall be verified on unaged test samples:

1. Dimensions
 - a. Diameter
The diameter shall be measured using a measuring tape or rule of length greater than the diameter of the bitumen sheet to be measured, permitting the measurement to be made to the nearest 1 mm.
 - b. Thickness
The thickness shall be measured in accordance with EN 1849-1.
2. Flow Resistance at elevated temperature in accordance with EN 1110

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD, the applicable European legal act has been specified in the Commission Delegated Decision (EU) 2018/771 of 25 January 2018 on the applicable system to assess and verify constancy of performance of anchor devices used for construction works and intended to prevent persons from falling from a height or to arrest falls from a height pursuant to Regulation (EU) No 305/2011 of the European Parliament and of the Council⁴, apply to factory made structural anchor for attaching personal fall protection equipment, designed to be permanently and fully bonded to a multi-layered roof waterproofing system.

Table 2 System(s) of assessment and verification of constancy of performance

Products and intended use	Essential characteristics	Applicable system ^a
Anchor devices used for construction works and intended to prevent persons from falling from a height or to arrest falls from a height	For all essential characteristics	1+
^a See Annex V to Regulation (EU) N° 305/2011		

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 4.

The manufacturer is allowed to use similar test or control methods, using different equipment and test samples under different conditions, as long as the manufacturer ensures constant product performances, but the frequency of control shall be respected.

Table 3 Control plan for the manufacturer and/or Technical Assessment Body; corner stones

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]*					
1	Strength of the assembly of steel components of the structural anchor		2.2.3		-
2	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a fall arrest system		2.2.4		-
3	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a restraint system		2.2.5		-

⁴ OJ L129, 25.05.2018, p. 82

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) including testing of samples taken at the factory in accordance with a prescribed test plan					
1. Incoming materials/products per delivered batch					
1	Flexible reinforced bituminous sheet		2.2.8		Once each batch delivery*
2	Anchor point, plates, spring washer and lock nut of stainless steel		2.2.7		Once each batch delivery*
2. Testing of the structural anchor					
3	Control of the build-up of the structural anchor		-		Once each week*
* Only in case of production					

3.3 Tasks of the Notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for factory made structural anchor for attaching personal fall protection equipment, designed to be permanently and fully bonded to a multi-layered roof waterproofing system are laid down in Table 4.

Table 4 Control plan for the notified body; cornerstones

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and factory production control					
1	Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer, addressing in particular: <ul style="list-style-type: none"> – personnel and equipment – the suitability of the factory production control system established by the manufacturer – full implementation of the control plan 	-	Specified in the control plan	-	-
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer.	-	Specified in the control plan	-	1/year
Audit — testing of samples taken by the notified product certification body at the manufacturing plant					
1	Strength of the assembly of steel components of the structural anchor	2.2.3	Cf. performance specified in the ETA	1 assembly	1/year
2	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a fall arrest system	2.2.4			

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control												
3	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a restraint system	2.2.5															
4	Tensile properties of the upper sheet of the structural anchor (force in N/50mm; strain in %)	EN 12311-1	<table border="1"> <tr> <td>force:</td> <td>long.:</td> <td>900 (± 20%)</td> </tr> <tr> <td></td> <td>trans.:</td> <td>750 (± 20%)</td> </tr> <tr> <td>Strain:</td> <td>long.:</td> <td>45 (± 15)</td> </tr> <tr> <td></td> <td>trans.:</td> <td>55 (± 15)</td> </tr> </table>	force:	long.:	900 (± 20%)		trans.:	750 (± 20%)	Strain:	long.:	45 (± 15)		trans.:	55 (± 15)	2 x 5 specimen in each direction	1/year
force:	long.:	900 (± 20%)															
	trans.:	750 (± 20%)															
Strain:	long.:	45 (± 15)															
	trans.:	55 (± 15)															
5	Flow resistance at elevated temperature of the lower sheet of the structural anchor (°C)	EN 1110	> 150	1	1/year												
6	Strength of the structural anchor on a multi-layered bituminous roof waterproofing system to be used in a fall arrest system																
	a) small scale testing before and after thermal ageing	EAD 330340-00-0606, clause 2.2.3.1 (*)	$\Delta s, 2 < 20\%$	5 specimen	Altering test a) and b) with a frequency of once per 3 years												
	b) small scale testing at low temperatures	EAD 330340-00-0606, clause 2.2.3.2	the rigid mass shall be arrested and held clearly from the ground	3 specimen													
(*) the test shall be conducted on specimens for which the ageing is applied on the combination of the structural anchor and the top layer of the multi-layered modified bituminous roof waterproofing membrane.																	

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

ETAG 005 – Part 1: March 2004	Guideline for European Technical Approval of liquid applied roof waterproofing kits – part 1: general
ETAG 006: March 2000, Amended November 2012	Systems of Mechanically Fastened Flexible Roof Waterproofing Membranes
EOTA TR 010: May 2004	Exposure procedure for artificial weathering
EOTA TR 034:	General BWR3 Checklist for EADs/ETAs Dangerous substances
EOTA TR 036: January 2013	A factory made structural anchor for attaching personal fall protection equipment, designed to be permanently bonded to a multi-layered modified bitumen roof waterproofing system provided with a polyester reinforcement to a maximum roof slope of 15 ⁰ , without perforating the roof waterproofing system. Testing procedures for: <ul style="list-style-type: none"> i. Strength of the assembly of the steel components of the structural anchor ii. Fall arrest system iii. Restraint system
EN 363: 2008	Personal fall protection equipment – Personal fall protection systems
EN 795: 2012	Personal fall protection equipment – Anchor devices
EN 1296	Flexible sheets for waterproofing – Bitumen, plastic and rubber sheets for roof waterproofing – Method of artificial ageing by long term exposure to elevated temperatures
EN 1297	Flexible sheets for waterproofing – Bitumen, plastic and rubber sheets for roof waterproofing – Method of artificial ageing by long term exposure to the combination of UV radiation, elevated temperature and water
EN 1850-1: 1999	Flexible sheets for waterproofing – Determination of visible effects – Part 1: Bitumen sheets for roof waterproofing
EN 10088-1: 2005	Stainless steels – Part 1: List of stainless steels
EN 12311-1	Flexible sheets for waterproofing - Part 1: Bitumen sheets for roof waterproofing - Determination of tensile properties
EN 13707: 2013	Flexible sheets for waterproofing – Reinforced bitumen sheets for roof waterproofing – Definitions and characteristics
EN 15976	Flexible sheets for waterproofing - Determination of emissivity
EN ISO 3506-1: 2010	Mechanical properties of corrosion-resistant stainless steel fasteners – Part 1: Bolts, screws and studs.
EN 1484	Water analysis - Guidelines for the determination of total organic carbon (TOC)
EN 27888	Water quality; determination of electrical conductivity
EN ISO 10523	Water quality - Determination of pH

EN ISO 11348-1	Water quality - Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 1: Method using freshly prepared bacteria
EN ISO 11348-2	Water quality - Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 2: Method using liquid-dried bacteria
EN ISO 11348-3	Water quality - Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i> (Luminescent bacteria test) – Part 3: Method using freeze-dried bacteria
EN ISO 6341	Water quality - Determination of the inhibition of the mobility of <i>Daphnia magna</i> Straus (Cladocera, Crustacea) - Acute toxicity test (ISO 6341:2012)
ISO 15799	Soil quality - Guidance on the ecotoxicological characterization of soils and soil materials

ANNEX A GUIDANCE FOR THE DETERMINATION OF THE MINIMUM ROOF SIZE

A1 Determination of the minimum roof size for attaching the structural anchor to multi-layered modified bituminous roof waterproofing system

A1.1 General

For the performance of the structural anchor to meet the intended use as defined in clause 1.2.1 of this EAD a minimum roof size is required.

Only the roof size – hemispherical shaped – opposite to the direction of the load on the structural anchor is determinant.

The multi-layered modified bituminous roof waterproofing systems can be distinguished in two specific groups as follows;

- Mechanically fastened, partial bonded and fully bonded roof waterproofing systems;
- Loose laid and ballasted roof waterproofing systems.

Based on the resistance to static and dynamic load the following can be established.

A1.2 Group 1: Mechanically fastened, partial bonded and fully bonded roof waterproofing systems.

The roof size – hemispherical shaped – opposite the direction of the load on the structural anchor is determinant.

A1.2.1 Mechanically fastened roof waterproofing systems

The following assumptions are made:

- Calculation value per fastener ≥ 400 N;
- Number of fasteners ≥ 4 per m^2 .

The structural anchor is to be “full scale” tested according clause II.4 and/or III.2 of TR 036.

If neither the roof waterproofing system nor the fasteners of the roof waterproofing system at the edge of the test specimen - opposite to the direction of the load - were damaged or deformed, it is assumed that a minimum roof size, opposite to the direction of the load on the structural anchor, hemispherical shaped with a radius of 2 m measured from the centre of the structural anchor, is sufficient for the performance of the structural anchor to meet the intended use as defined in clause 1.2.1 of this EAD.

A1.2.2 Partial bonded and fully bonded roof waterproofing systems

For partially and fully bonded bituminous roof waterproofing systems the strength of the roof waterproofing system, necessary to resist the static component of the wind load on the roof, is far more critical compared to the bonding strength between the roof waterproofing system and the substructure, necessary to resist the dynamic force of the structural anchor. This is due to the viscous nature of bitumen.

The surface area of the adhered (partial bonded or fully bonded) roof waterproofing system is much larger than the surface area of the adhered structural anchor.

The minimum roof size for partially and fully bonded roof waterproofing systems is considered as being the same as for the mechanically fastened roof waterproofing system, e.g. opposite to the direction of the load on the structural anchor, hemispherical shaped with a radius of 2 m measured from the centre of the structural anchor.

A1.3 Group 2: Loose laid and ballasted roof waterproofing systems.

The roof size – hemispherical shaped – opposite the direction of the load on the structural anchor is determinant.

To determine the minimum roof size for the structural anchor to meet the intended use as defined in clause 1.2.1 of this EAD on loose laid and ballasted roof waterproofing systems, the structural anchor is to be “full scale” tested according clause II.4 and/or III.2 of TR 036, but with the following changes:

- The test is performed at $(20 \pm 5)^\circ\text{C}$;
- The specimen is not to be fixed to the substructure at the edge (figure ii.1 of TR 036);
- The specimen is ballasted (i.e. Gravel or concrete tiles).

According to clause 4.4.5.2 of EN 795:2012 the horizontal displacement shall not exceed 1000 mm.