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Autorisé et notifié conformément à l'article 10 de la directive 89/106/EEC du Conseil, du 21 décembre 1988, relative au rapprochement des dispositions législatives, réglementaires et administratives des Etats membres concernant les produits de construction.

CSTB le futur en construction

EOTA MEMBER

European Technical Approval ETA-06/0029

(English language translation, the original version is in French language)

Trade name: Nom commercial:	**FORCE**
Holder of approval: Titulaire:	**AXTER** **8, rue Félix d'Hérelle** **F-75016 PARIS**
Generic type and use of construction product: Type générique et utilisation prévue du produit de construction:	**Systems of mechanically fastened flexible roof waterproofing membranes** Systèmes de feuilles souples d'étanchéités de toitures fixés mécaniquement
Validity from: **to:** Valide du/au :	**10/07/2006** **09/07/2011**
Manufacturing plant: Usine de fabrication:	**Usine AXTER** **1, rue Joseph Coste** **F-59552 COURCHELETTES**
This European Technical Approval contains: Le présent Agrément Technique Européen contient:	**28 pages including 18 annexes which form an integral part of the document.** 28 pages incluant 18 annexes faisant partie intégrante du document.

I LEGAL BASES AND GENERAL CONDITIONS

1 - This European Technical Approval is issued by the Centre Scientifique et Technique du Bâtiment (CSTB) in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2];

- Décret no. 92-647 du 8 juillet 1992[3] concernant l'aptitude à l'usage des produits de construction;

- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC[4];

- Guide d'Agrément Technique Européen ''Systèmes de feuilles souples d'étanchéités de toitures fixés mécaniquement'' n°006, Mai 2002, french version of the ETAG 006, March 2000.

2 - The Centre Scientifique et Technique du Bâtiment is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant (for example concerning the fulfilment of assumptions made in this European Technical Approval with regard to manufacturing). Nevertheless, the responsibility for the conformity of the products with the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 - This European Technical Approval is not to be transferred by CSTB to manufacturers or agents of manufacturer other than those indicated on page 1; or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 - This European Technical Approval may be withdrawn by the Centre Scientifique et Technique du Bâtiment pursuant to Article 5 of the Council Directive 89/106/EEC.

5 - Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of the Centre Scientifique et Technique du Bâtiment. In this case, partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 - The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities no. L 40, 11.2.1989, p. 12
2 Official Journal of the European Communities no. L 220, 30.8.1993, p. 1
3 Journal Officiel de la République française du 14 juillet 1992
4 Official Journal of the European Communities no. L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of product

The systems of mechanically fastened flexible roof waterproofing membrane, subject of this ETA and called MEFAWAME in the text, are waterproofing kits composed of two-layers flexible roof waterproofing systems mechanically fastened with point fasteners to the structure, with a slope ≥ 1%. The first layer is fastened with overlappings eventually welded. The 2nd layer is torched welded on the 1st layer.

The MEFAWAME is composed of flexible membranes manufactured by the holder of the approval and mechanical fasteners manufactured by others manufacturers.

1.1.1 Membranes

First layer (fastened)	Second layer
MATFIX	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
MATFIX S3R	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
TOPFIX FMP grésé	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
TOPFIX FMP	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5

Composition of the membranes

Membrane	Bitumen	Average thickness on selvedge	Reinforcement	Surface	Underside
MATFIX	Elastomeric (SBS) binder	1.6 (1)	Glass fibre	Film	Polyester
MATFIX S3R	Elastomeric (SBS) binder	3.0 (1)	Glass fibre	Macro-perforated film and sand	Polyester
TOPFIX FMP	Elastomeric (SBS) binder	2.65	Reinforced polyester	Macro-perforated film and sand	Thermofusible film
TOPFIX FMP grésé	Elastomeric (SBS) binder	2.65	Reinforced polyester	Macro-perforated film and sand	Sand
FORCE 4000 S	Elastomeric (SBS) binder	4.0	Reinforced polyester	Slate chippings or mineral granules	Thermofusible film
FORCE 4000 S FE	Elastomeric (SBS) binder	4.0	Reinforced polyester	Slate chippings or mineral granules	Thermofusible film
FORCE 4000 FMG	Elastomeric (SBS) binder	4.0	Reinforced polyester	Slate chippings or mineral granules	Sand
FORCE 4000 FMG FE	Elastomeric (SBS) binder	4.0	Reinforced polyester	Slate chippings or mineral granules	Sand
RUBEROOF 4025 A	Elastomeric (SBS) binder	4.0	Reinforced polyester	Slate chippings or mineral granules	Thermofusible film
FORCE 50 G FM	Elastomeric (SBS) binder	4.2 (2)	Reinforced polyester	Slate chippings or mineral granules	Thermofusible film
PYE PV 200 S5	Elastomeric (SBS) binder	5.2 (3)	Reinforced polyester	Slate chippings or mineral granules	Thermofusible film

(1) Average overall thickness
(2) Average thickness on mineral granules
(3) Minimum thickness on mineral granules

The characteristics of these membranes are presented in Annexes 1 to 11. For all the membranes with mineral protection, the loss of mineral granule, tested in conformity with the EN 12039, is ≤ 30%.

1.1.2 Fasteners

The fastener, manufactured by the manufacturer LR ETANCO, is:

- screw VMS 2C + plate 40x40

Composition of the fastener:

Screw

- VMS 2C: hardened carbon steel screw. Diameter of 4,8 mm, length L and with a 8.5 mm circular head. Supracoat corrosion protection. Resistance at 15 Kesternich cycles (EN ISO 6988).

Plate

- 40x40 : steel plate 40x40 mm, thickness 0.8 mm. Hole Ø 4.5 mm. Aluzinc AZ 150 protection.

The fastener is conform to the specifications of the ETAG 006. It owns a *Fastener PASS "Intermediate evaluation in compliance with the European Technical Approval Guideline n°006".*

The flexible membranes and the fastener are commercialised in separate transactions and assembled on site.

The different kits are presented in Annexes 13.

The holder of the ETA is fundamentally responsible of the kit.

1.2 Intended use

The kits for the waterproofing of roof surfaces against penetration of atmospheric water are intended for uses where requirements concerning safety in case of fire, hygiene, health and the environment and safety in use as well as the durability in the sense of the essential requirements N° 2 to N° 4 of the Directive 89/106/EEC shall be satisfied.

The bearing elements are metallic, in concrete, in lightweight concrete or in wood. The bearing elements can be direct substrates of the MEFAWAME. In the case where the insulation is the direct substrate of the MEFAWAME, it shall be conform with the requirements of § 4.2.2. The insulation is not a part of the kit.

In the manufacturer's technical dossier (MTD)[5] to this European technical approval (ETA) the manufacturer gave information concerning the substrate which the roof waterproofing is suitable for.

The verifications which are based on this ETA give reason for the assumption of an intended working life of the roof waterproofing of at least 10 years.

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

The part of the MTD to this ETA to be treated confidentially is deposited with CSTB and, as far as this is relevant to the tasks of the notified body involved in the procedure of attestation of conformity, shall be handed over to the notified body.

2 Characteristics of product and methods of verification

2.1 Characteristics of products and systems

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

The ETA is issued for the kit on the basis of the product composition deposited with CSTB. Changes to the components of the kit or in the production process of the components, which could result in the production process and/or the properties of the product deposited being incorrect should be notified to CSTB before the changes are introduced. CSTB will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment/alterations to the ETA shall be necessary.

The performances of the bituminous membranes, the fasteners and the kits are presented in Annexes 1 to 14.

2.2 Methods of verification

Assessment of the fitness of the roof waterproofing for the intended use with regard to the essential requirements N° 2 to N° 4 was performed following the "Guideline for European Technical Approval of systems of mechanically fastened flexible roof waterproofing membranes" (ETAG 006).

According to the manufacturer's declaration the roof waterproofing taking account of the EU database[6] does not contain any dangerous or forbidden substances.

[5] The manufacturer's technical dossier (MTD) comprises all information necessary for the production and the processing of the product. It was checked by CSTB and it was found to be in accordance with the conditions stated in the approval and the characteristic values determined during the approval testing. The part of the MTD to this ETA to be treated confidentially is deposited with CSTB and, as far as this is relevant to the tasks of the notified body involved in the procedure of attestation of conformity, shall be handed over to the notified body.

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

These requirements need also to be complied with. Moreover, this assessment could be extended with other requirements applicable to the products, resulting from the application of other national regulations and administrative provisions.

3 Evaluation of Conformity and CE marking

3.1 Attestation of conformity system

The European Commission according to the decision (98/143/EC of February 1998, Official Journal of the European Communities No. L 42, 14.02.1998) on the Procedures of Attestation of Conformity has, for this type of product, laid down a: **System 2+,** for the procedure of attestation of conformity (Annex III, clause 2(ii) first possibility of Directive 89/106/EEC) for Systems of mechanically fastened flexible roof waterproofing membranes. The system of attestation of conformity 2+ (referred to as system 2+) provides:

a) Tasks of the manufacturers:
   1. Initial type testing of the product
   2. Factory production control

b) Tasks of the Notified Body:
   3. initial inspection of factory and of factory production control (FPC)
   4. continuous surveillance, assessment and approval of factory production control

3.2 Responsabilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer of flexible membranes and the manufacturers of fasteners have different factory production control (FPC) systems.

The manufacturer of flexible membranes has a factory production control (FPC) system in its plant and exercises permanent internal control of production. This FPC is conform to the EN 13707. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturers of fasteners have a factory production control system in their plant and exercise permanent internal control of production. This FPC is conform to the ETAG 006. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturer of flexible membranes and the manufacturers of fasteners shall use raw materials or components that comply with the indications of the MTD. The content of the control plan has been checked by CSTB and is stipulated in the MTD.

The results of the factory production control shall be recorded and evaluated. The records shall include at least the following information :

[6] Database ''Dangerous substances'' consulted on the website http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm, version 17 march 2003.

- Name of the product and the raw materials,

- Type of inspection or control,

- Date of manufacture of the product, batch number, and date of inspection or control of the product,

- Results of inspections or controls and, as far as applicable, comparison with requirements,

- Signature of the person responsible for factory production control or his representant.

The records shall be kept for at least five years. On request, they shall be presented to CSTB.

The control plan is a confidential part of the MTD and is deposited with CSTB.

3.2.1.2 Initial type-testing of the product

The initial type-testing refers to the product properties stated in EOTA Guideline 006 to this European technical approval.

The verifications underlying this ETA have been furnished on samples (membranes and fasteners) from the current production. These will replace the initial type-testing.

After changing the production process or starting the production in another manufacturing plant the initial type-testing shall be repeated.

3.2.1.3 Other tasks of the manufacturer

The manufacturers shall, on the basis of a contract, involve a body which is notified for the tasks referred to in section 3. For this purpose, the control plan referred to in section 3.2.2 shall be handed over by the manufacturer to the notified body involved.

3.2.2 Tasks of the Notified Bodies

3.2.2.1 Initial inspection of factory and production control.

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

3.2.2.2 Continuous surveillance, assessment and approval of Factory Production Control

The Notified Body shall visit the factory of flexible membranes and the factories of fasteners once a year.

Surveillance of the manufacturing processes shall include:

- Checking the documentation of factory production control, to ensure continuing compliance with the provisions of the ETA,

- Identification of changes by comparing data obtained during the initial inspection or during the last inspection.

In the event the ETA provisions are not complied with, the certificate of conformity shall be withdrawn by the notified body and CSTB will be informed without delay.

3.3 CE Marking

The CE marking shall be affixed on the kit, components itself/themselves, an attached label, the packaging, or the accompanying commercial document.

The required information to accompany the symbol ''CE'' is :

- name or identifying name of the producer,
- number of the notified body involved (system 2+),
- number of the certificate of conformity of the Factory Production Control (system 2+)
- last two digits of the year in which the CE marking was affixed,
- number of the ETA,
- number of the ETAG.

The components shall be marked as belonging to the kit FORCE.

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

4.1 Installation and design

Information concerning installation and design is part of the non confidential part of the MTD.

See Technical Notices in Annexes 15 to 18.

The flexible membranes manufacturer's installation guide forms part of this ETA.

The design of the roof intended to be covered by the mechanically fastened roof waterproofing system should take account of the following factors :

- Dead and imposed loads
- Design wind pressure
- Structural strength, stiffness and deflection limits
- Attachment of the roof deck to the structural framing
- Provision of insulation
- Assessment of condensation risk and provision of vapour control layers
- Sound insulation
- Fire precautions
- Roof attachments, fixtures and penetrations
- Falls and drainage
- Means of access for inspection and maintenance

4.2 Substrates

The substrate onto which the waterproofing kit is to be laid should be sufficiently rigid, dense, and dimensionally stable to support the system (membrane + insulation). Its nature will depend on the type of roof selected (warm deck, cold deck or inverted) and in turn will have a direct influence on the method of attachment.

In order to support the loads imposed by traffic, insulation materials for use in warm decks should be capable of resisting permanent deformation or damage when subjected to concentrated loads. They should have a dust-free surface and sufficient laminar strength to resist with a margin of safety and stress imposed by wind uplift forces.

It shall be ensured that the insulation material on site has:

- a 10% compression ≥ 60kPa (EN 826)
- a point load behaviour ≥ 500 Pa, deformation 5 mm (EN 12430)

The insulation material must be CE marked according to the harmonized European standard.

4.3 Flexible membranes manufacturer's responsibilities

It is the manufacturer's responsibility to make sure that all those who use the kit are appropriately informed about the specific conditions according to sections 1, 2, 4, and 5 including the annexes to this ETA and the not confidential parts of the MTD to this ETA.

5 Informations by the manufacturer

Information about packaging, transport, storage, maintenance and repair are part of the non confidential part of the MTD.

5.1 Packaging, transport and storage

This product is not toxic, so it is not necessary to follow any safety instructions for transport and handling.

Storage must be at temperatures between -25°C and 45°C, in dry, and protected against direct sunlight.

Rolls must always be stored vertically.

The product must keep away from any source of heat, sparks, flame, etc.

5.2 Maintenance and repair of the works

The assessment of the fitness for use is based on the assumption that a normal maintenance of the system is performed.

This maintenance shall include :

- inspections of the roof at regular interval, e.g. twice a year
- this inspection should include :

- cleaning of downpipes and leaf filters
- removal of stones, branches and leafs…
- inspection of flashings along the edge of the roof, chimneys, drains and roof lights

- removal of organic growths such as vines

  - Elastic joints around cover strips should be inspected every 5 years and replaced if necessary

  - Flashings to caps, drains etc. should be inspected every 5 years and replaced if necessary

  - Abrasion and minor impact damage shall be repaired.

When replacing components they shall be approved by the manufacturer and covered by the ETA.

The original version is signed by
H. BERRIER

Technical Director of CSTB

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MATFIX

CHARACTERISTICS				*TEST METHOD*	*UNITS*	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12316-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12317-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		*EN 1109*	*°C*	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			*EN 12310-1*	*N*	300	200	400
	Width					250	170	350
Tensile properties: maximum tensile force	Length			*EN 12311-1*	*N/50 mm*	400	300	500
	Width					300	200	400
Tensile properties: elongation	Length			*EN 12311-1*	*%*	3	2	4
	Width					3	2	4
Resistance to impact				*EN 12691*	*mm*	30	≤	
Resistance to static loading				*EN 12730*	*kg*	15	≥	
Dimensional stability				*EN 1107-1*	*%*	0.3	≤	
Watertightness				*EN 1928:2000*	-	Pass		
Water vapour transmission properties				*EN 1931*	-	μ=20000		
Reaction to fire				*EN 13501-1*	-	F		

NR: Not Relevant

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MATFIX S3R

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	°C	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	300	200	400
	Width					250	150	350
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	400	300	500
	Width					300	200	400
Tensile properties: elongation	Length			EN 12311-1	%	3	2	4
	Width					3	2	4
Resistance to impact				EN 12691	mm	30	≤	
Resistance to static loading				EN 12730	kg	15	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	E		

NR: Not Relevant

MEFAWAME ''FORCE''

System of mechanically fastened flexible roof waterproofing membranes

Characteristics of MATFIX S3R

Annex 2
of European Technical Approval
ETA-06/0029

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TOPFIX FMP grésé

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	°C	-14	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	170	140	220
	Width					170	120	240
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	450	320	490
	Width					270	250	310
Tensile properties: elongation	Length			EN 12311-1	%	30	10	45
	Width					55	10	80
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	10	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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TOPFIX FMP

CHARACTERISTICS				*TEST METHOD*	*UNITS*	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12316-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12317-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		*EN 1109*	*°C*	-14	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			*EN 12310-1*	*N*	170	140	220
	Width					170	120	240
Tensile properties: maximum tensile force	Length			*EN 12311-1*	*N/50 mm*	450	320	490
	Width					270	250	310
Tensile properties: elongation	Length			*EN 12311-1*	*%*	30	10	45
	Width					55	10	80
Resistance to impact				*EN 12691*	*mm*	20	≤	
Resistance to static loading				*EN 12730*	*kg*	10	≥	
Dimensional stability				*EN 1107-1*	*%*	0.3	≤	
Watertightness				*EN 1928:2000*	-	Pass		
Water vapour transmission properties				*EN 1931*	-	μ=20000		
Reaction to fire				*EN 13501-1*	-	F		

NR: Not Relevant

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FORCE 4000 S

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	°C	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	240	180	300
	Width					280	230	360
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	780	500	900
	Width					650	500	730
Tensile properties: elongation	Length			EN 12311-1	%	45	25	55
	Width					50	25	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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FORCE 4000 S FE

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	°C	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	240	180	300
	Width					280	230	360
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	780	500	900
	Width					650	500	730
Tensile properties: elongation	Length			EN 12311-1	%	45	25	55
	Width					50	25	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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FORCE 4000 FMG

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	200	150	280
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
	Average strength	Before heat ageing	Length			160	110	240
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	750	550	900
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	℃	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	240	180	300
	Width					280	230	360
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	780	500	900
	Width					650	500	730
Tensile properties: elongation	Length			EN 12311-1	%	45	25	55
	Width					50	25	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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FORCE 4000 FMG FE

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	200	150	280
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
	Average strength	Before heat ageing	Length			160	110	240
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	750	550	900
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	℃	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	240	180	300
	Width					280	230	360
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	780	500	900
	Width					650	500	730
Tensile properties: elongation	Length			EN 12311-1	%	45	25	55
	Width					50	25	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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RUBEROOF 4025 A

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	℃	-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
	Underside	Before heat ageing				-20	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15℃		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	240	180	300
	Width					280	230	360
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	780	500	900
	Width					650	500	730
Tensile properties: elongation	Length			EN 12311-1	%	45	25	55
	Width					50	25	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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FORCE 50 G FM

CHARACTERISTICS				TEST METHOD	UNITS	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	EN 12316-1	(N/50mm)	130	80	180
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
	Average strength	Before heat ageing	Length			100	50	150
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	EN 12317-1	(N/50mm)	650	500	850
			Width					
		After heat ageing EN 1296	*Length*			Decrease after ageing ≤ 20%		
			Width					
Flexibility at low temperature	Surface	Before heat ageing		EN 1109	°C	-14	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-18	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			EN 12310-1	N	250	160	290
	Width					250	210	290
Tensile properties: maximum tensile force	Length			EN 12311-1	N/50 mm	700	500	820
	Width					560	500	680
Tensile properties: elongation	Length			EN 12311-1	%	45	42	50
	Width					50	42	60
Resistance to impact				EN 12691	mm	20	≤	
Resistance to static loading				EN 12730	kg	20	≥	
Dimensional stability				EN 1107-1	%	0.3	≤	
Watertightness				EN 1928:2000	-	Pass		
Water vapour transmission properties				EN 1931	-	μ=20000		
Reaction to fire				EN 13501-1	-	F		

NR: Not Relevant

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PYE PV 200 S5

CHARACTERISTICS				*TEST METHOD*	*UNITS*	VALUE or STATEMENT	TOLERANCES mini	TOLERANCES Maxi
Peel resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12316-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
	Average strength	Before heat ageing	Length					
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Shear resistance of joints	Maximal strength	Before heat ageing	Length	*EN 12317-1*	*(N/50mm)*	NR		
			Width					
		After heat ageing EN 1296	*Length*					
			Width					
Flexibility at low temperature	Surface	Before heat ageing		*EN 1109*	*°C*	-24	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
	Underside	Before heat ageing				-24	≤	
		After heat ageing EN 1296				Decrease after ageing ≤ 15°C		
Resistance to tearing (nail shank)	Length			*EN 12310-1*	*N*	270	200	350
	Width					300	220	380
Tensile properties: maximum tensile force	Length			*EN 12311-1*	*N/50 mm*	980	800	1080
	Width					900	800	1000
Tensile properties: elongation	Length			*EN 12311-1*	*%*	50	40	60
	Width					55	40	65
Resistance to impact				*EN 12691*	*mm*	20	≤	
Resistance to static loading				*EN 12730*	*kg*	20	≥	
Dimensional stability				*EN 1107-1*	*%*	0.5	≤	
Watertightness				*EN 1928:2000*	-	Pass		
Water vapour transmission properties				*EN 1931*	-	μ=20000		
Reaction to fire				*EN 13501-1*	-	E		

NR: Not Relevant

Name of the fastener *Producer*	Axial load[3] (N)	Resistance to corrosion : OK or not relevant[1]	Resistance to unwinding	Mechanical resistance before and after heat ageing : OK or not OK[2]
VMS 2C + 40x40 *LR ETANCO*	2000	OK	OK	not relevant

[1] OK = less than 15% surface corrosion after the test in accordance of the § 5.3.7.1 of the ETAG 006
Not relevant = stainless steel fasteners or plastic sleeves

[2] OK = decrease in the drop height is equal to or less than 20% after ageing

[3] Declared values

First layer (fastened)	Fastener	Second layer
MATFIX	VMS 2C + 40X40	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
MATFIX S3R	VMS 2C + 40X40	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
TOPFIX FMP grésé	VMS 2C + 40X40	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5
TOPFIX FMP	VMS 2C + 40X40	▪ FORCE 4000 S ▪ FORCE 4000 S FE ▪ FORCE 4000 FMG ▪ FORCE 4000 FMG FE ▪ RUBEROOF 4025 A ▪ FORCE 50 G FM ▪ PYE PV 200 S5

Kit	W admissible*	External fire performance
Kits with MATFIX fastened with VMS 2C + 40x40	417 N/fastener	npd
Kits with MATFIX S3R fastened with VMS 2C + 40x40	407 N/fastener	npd
Kits with TOPFIX FMP grésé fastened with VMS 2C + 40x40	417 N/fastener	npd
Kits with TOPFIX FMP fastened with VMS 2C + 40x40	417 N/fastener	npd

*Determined with a full scale wind uplift test with steel substrate. Axial loading resistance of the fastener used in the full scale concept is : R_{oc} = 2000 N

In order to determine the W_{adm} of systems with other substrates than the reference substrate, or other fasteners (R_{nc}) owning a separate ETA issued on the basis of ETAG006 or *Fastener PASS FOR MEFAWAME ETA ''Intermediate evaluation in compliance with the European Technical Approval Guideline n°006''*) issued on the basis of ETAG006, the following applies :

- if $R_{nc} \geq R_{oc}$ => W_{adm} (nc) = W_{adm} (oc)
- if $R_{nc} < R_{oc}$ => W_{adm} (nc) = (R_{nc} / R_{oc}) * W_{adm} (oc)

The adaptation of the full scale test results for systems with other substrates than the reference substrate, or other fasteners (R_{nc}) owning a separate ETA or *Fastener PASS* issued on the basis of ETAG 006, is possible if:

- the plates are protected against corrosion;
- the minimal thickness of the metallic plates is:
  0.75 mm, if they are ribbed,
  1,00 mm, if they are flat.

In the new system, the use of plates that are different from those in the reference system is possible under the following conditions:

- The steel plates are permitted with their resistance R determined in the whole system,
- The metal grades and thicknesses are ≥ those of reference ones,
- The dimensions comply with the conditions in the following Table.

plates "oc"	plates "nc"	
	Round washers	**Square, rectangular or oblong washers**
Rounds: ∅ test	∅ ≥ ∅ test	Width and length ≥ ∅ test
Square, rectangular or oblong	∅ ≥ diagonal of the washer tested	Dimensions ≥ those tested and positioned in the same direction

oc = original combination (tested)
nc = new combination

The fasteners have to be in conformity with the specifications given in section 1.1.2 and have to own an ETA delivered on the basis on the ETAG 006 or a FASTENER PASS FOR MEFAWAME ETA ''Intermediate evaluation in compliance with the European Technical Approval Guideline n°006'' .

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ETA FORCE

TECHNICAL NOTICE n°1

LAYERS

Fastened layer	*MATFIX*	
Second layer	FORCE 4000 S	RUBEROOF4025 A
	FORCE 4000 S FE	FORCE 50 G FM
	FORCE 4000 FMG	PYE PV 200 S5
	FORCE 4000 FMG FE	

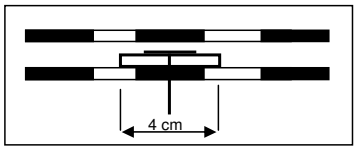
FASTENER

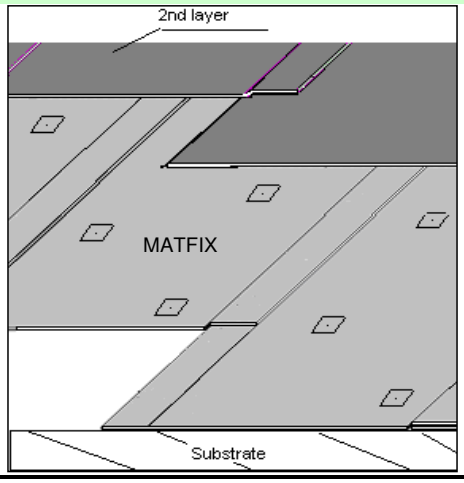
Reference Screw : VMS 2C Roc = 200 daN
Reference Plate : 40x40

Adaption of system to use other fasteners or washers is described in the "cahier du CSTB n° 3532: Wind resistance of roof waterproofing systems" dated July 2005. These are only permitted if they achieve an "fastener pass for MEFAWAME ETA" by their manufacturer.

USAGE

The first layer (underlay) is loose laid and mechanically fixed by two or three rows of fixing, the spacing between 2 rows should be identical. Side and end laps are min. 5 cm.
The second layer (cap sheet) is torch welded, with min. 8 cm laps, staggered by at least 10cm or at right angles from those on the first layer. End laps are 15 cm.





Spacing of fasteners (S)

The density of fasteners is calculated according to:
Position on the roof
Admissible load per fastener: Wadm (N/fas)
National requirements
Minimum distance in row: 12 cm
Maximum distance in row : according to national requirements

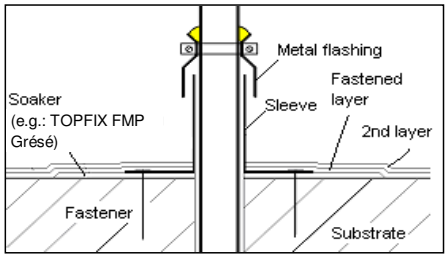
Calculation of spacing (S) between two fasteners S ≤ 1/(DxL) = Wadm/(LxDp); Wadm = 417 N/fas on steel deck

D = minimal density of fasteners = Dp / Wadm
L = spacing between two rows of fasteners
Dp(N/m²) = Wind effect on the specified area. Dp is determined according to the national requirements

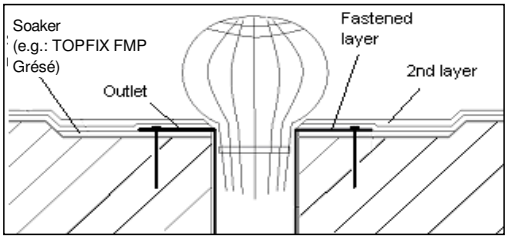
FASTENING AT UPSTANDS AND PENETRATIONS

Upstands
System of fastening: spot fastening
The spacing (S) between two fasteners is determined using the same method as before. Maximum spacing : 33 cm
The flashing design must conform to national requirements

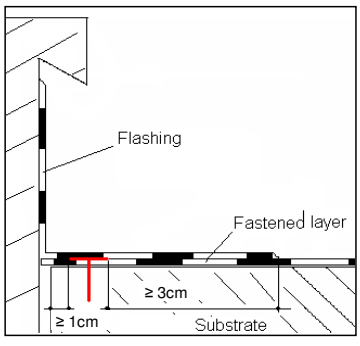
Penetrations
Fastener at every corner of the plate. Their design must conform to national requirements



Penetration



Rainwater outlet



Upstand

MEFAWAME ''FORCE''

System of mechanically fastened flexible roof waterproofing membranes

Technical Notice about kits with MATFIX fastened with VMS 2C + 40x40

Annex 15
of European Technical Approval
ETA-06/0029

AXTER
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ETA FORCE

TECHNICAL NOTICE n°2

LAYERS

Fastened layer	*MATFIX S3R*	
Second layer	FORCE 4000 S	RUBEROOF4025 A
	FORCE 4000 S FE	FORCE 50 G FM
	FORCE 4000 FMG	PYE PV 200 S5
	FORCE 4000 FMG FE	

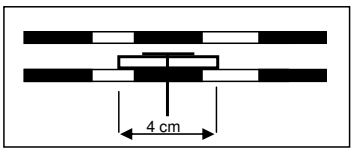
FASTENER

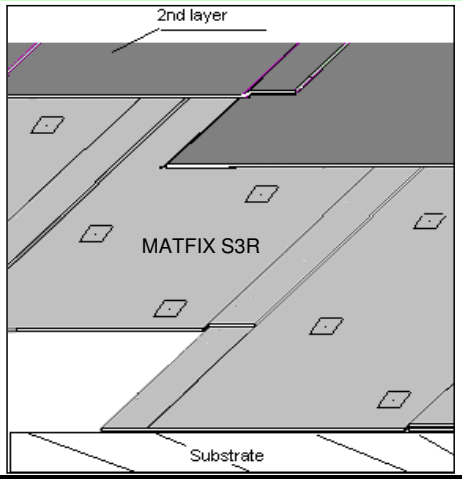
Reference Screw : VMS 2C Roc = 200 daN
Reference Plate : 40x40

Adaption of system to use other fasteners or washers is described in the "cahier du CSTB n° 3532: Wind resistance of roof waterproofing systems" dated July 2005. These are only permitted if they achieve an "fastener pass for MEFAWAME ETA" by their manufacturer.

USAGE

The first layer (underlay) is loose laid and mechanically fixed by two or three rows of fixing, the spacing between 2 rows should be identical. Side and end laps are min. 5 cm.
The second layer (cap sheet) is torch welded, with min. 8 cm laps, staggered by at least 10cm or at right angles from those on the first layer. End laps are 15 cm.





Spacing of fasteners (S)

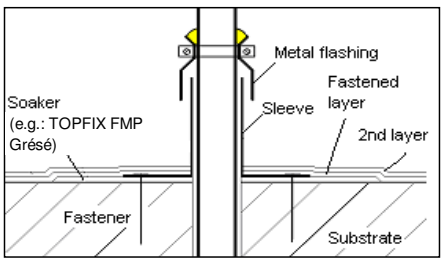
The density of fasteners is calculated according to:
Position on the roof
Admissible load per fastener: Wadm (N/fas)
National requirements
Minimum distance in row: 12 cm
Maximum distance in row : according to national requirements

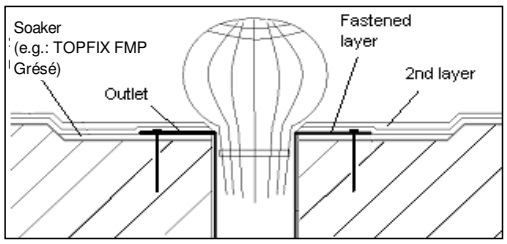
Calculation of spacing (S) between two fasteners S ≤ 1/(DxL) = Wadm/(LxDp); Wadm = 407 N/fas on steel deck

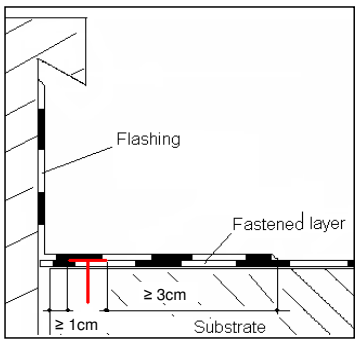
D = minimal density of fasteners = Dp / Wadm
L = spacing between two rows of fasteners
Dp(N/m²) = Wind effect on the specified area. Dp is determined according to the national requirements

FASTENING AT UPSTANDS AND PENETRATIONS

Upstands
System of fastening: spot fastening
The spacing (S) between two fasteners is determined using the same method as before. Maximum spacing : 33 cm
The flashing design must conform to national requirements
Penetrations
Fastener at every corner of the plate. Their design must conform to national requirements







Penetration ***Rainwater outlet*** ***Upstand***

MEFAWAME ''FORCE''
System of mechanically fastened flexible roof waterproofing membranes

Technical Notice about kits with MATFIX S3R fastened with VMS 2C + 40x40

Annex 16
of European Technical Approval
ETA-06/0029

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ETA FORCE

TECHNICAL NOTICE n°3

LAYERS

Fastened layer *TOPFIX FMP Grésé*

Second layer	FORCE 4000 S	RUBEROOF4025 A
	FORCE 4000 S FE	FORCE 50 G FM
	FORCE 4000 FMG	PYE PV 200 S5
	FORCE 4000 FMG FE	

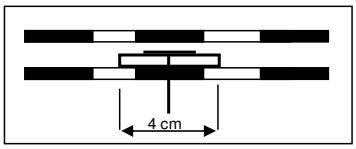
FASTENER

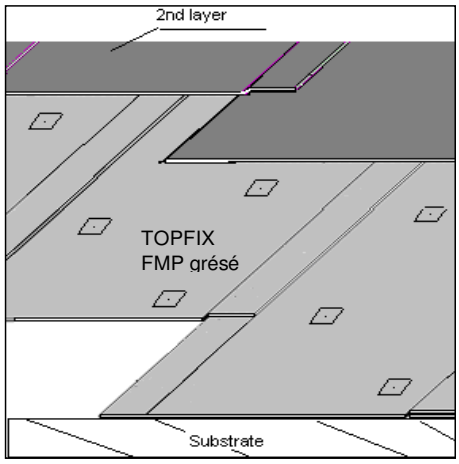
Reference Screw : VMS 2C Roc = 200 daN
Reference Plate : 40x40

Adaption of system to use other fasteners or washers is described in the "cahier du CSTB n° 3532: Wind resistance of roof waterproofing systems" dated July 2005. These are only permitted if they achieve an "fastener pass for MEFAWAME ETA" by their manufacturer.

USAGE

The first layer (underlay) is loose laid and mechanically fixed by two or three rows of fixing, the spacing between 2 rows should be identical. Side and end laps are min. 5 cm.
The second layer (cap sheet) is torch welded, with min. 8 cm laps, staggered by at least 10cm or at right angles from those on the first layer. End laps are 15 cm.





Spacing of fasteners (S)

The density of fasteners is calculated according to:
Position on the roof
Admissible load per fastener: Wadm (N/fas)
National requirements
Minimum distance in row: 12 cm
Maximum distance in row : according to national requirements

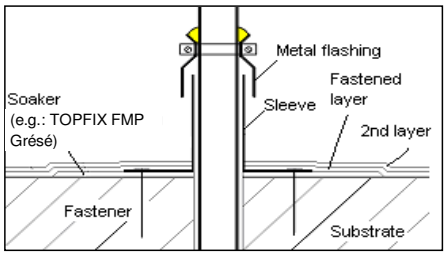
Calculation of spacing (S) between two fasteners S ≤ 1/(DxL) = Wadm/(LxDp); Wadm = 417 N/fas on steel deck

D = minimal density of fasteners = Dp / Wadm
L = spacing between two rows of fasteners
Dp(N/m²) = Wind effect on the specified area. Dp is determined according to the national requirements

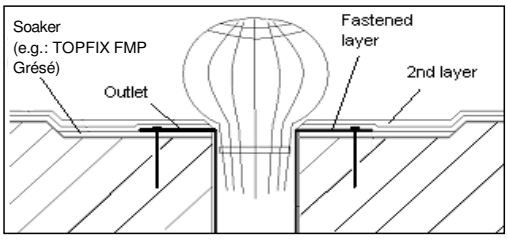
FASTENING AT UPSTANDS AND PENETRATIONS

Upstands
System of fastening: spot fastening
The spacing (S) between two fasteners is determined using the same method as before. Maximum spacing : 33 cm
The flashing design must conform to national requirements

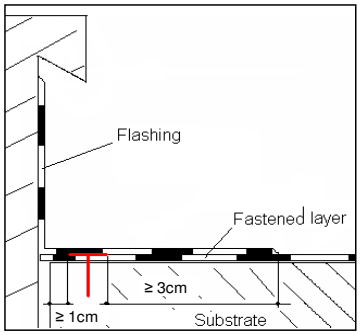
Penetrations
Fastener at every corner of the plate. Their design must conform to national requirements



Penetration



Rainwater outlet



Upstand

MEFAWAME ''FORCE''

System of mechanically fastened flexible roof waterproofing membranes

Technical Notice about kits with TOPFIX FMP Grésé fastened with VMS 2C + 40x40

Annex 17
of European Technical Approval
ETA-06/0029

AXTER
8, avenue Félix d'Hérelle F-75016 PARIS
Tél. : 00 33 1 46 09 39 60 - Fax : 00 33 1 46 09 39 61

ETA FORCE

TECHNICAL NOTICE n°4

LAYERS

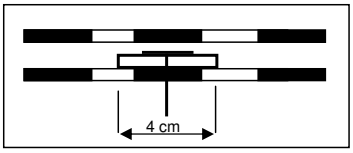
Fastened layer	*TOPFIX FMP*	
Second layer	FORCE 4000 S	RUBEROOF4025 A
	FORCE 4000 S FE	FORCE 50 G FM
	FORCE 4000 FMG	PYE PV 200 S5
	FORCE 4000 FMG FE	

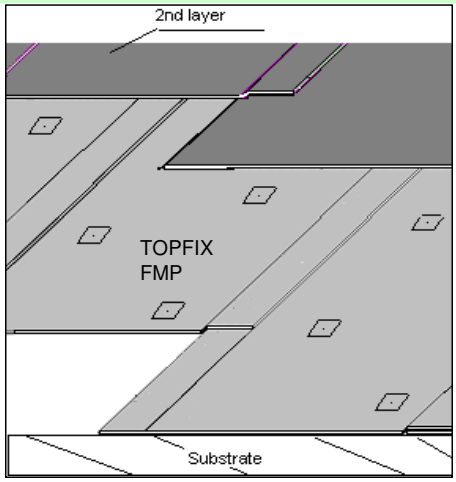
FASTENER

Reference Screw : VMS 2C Roc = 200 daN
Reference Plate : 40x40
Adaption of system to use other fasteners or washers is described in the "cahier du CSTB n° 3532: Wind resistance of roof waterproofing systems" dated July 2005. These are only permitted if they achieve an "fastener pass for MEFAWAME ETA" by their manufacturer.

USAGE

The first layer (underlay) is loose laid and mechanically fixed by two or three rows of fixing, the spacing between 2 rows should be identical. Side and end laps are min. 5 cm.
The second layer (cap sheet) is torch welded, with min. 8 cm laps, staggered by at least 10cm or at right angles from those on the first layer. End laps are 15 cm.





Spacing of fasteners (S)

The density of fasteners is calculated according to:
Position on the roof
Admissible load per fastener: Wadm (N/fas)
National requirements
Minimum distance in row: 12 cm
Maximum distance in row : according to national requirements

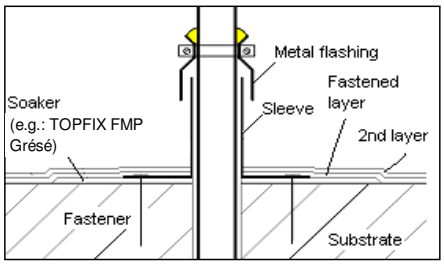
Calculation of spacing (S) between two fasteners S ≤ 1/(DxL) = Wadm/(LxDp); Wadm = 417 N/fas on steel deck

D = minimal density of fasteners = Dp / Wadm
L = spacing between two rows of fasteners
Dp(N/m²) = Wind effect on the specified area. Dp is determined according to the national requirements

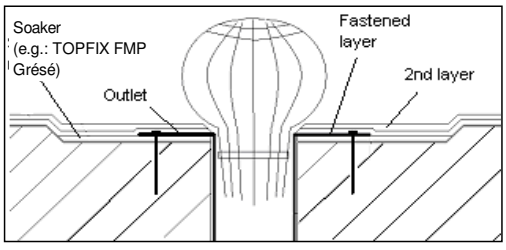
FASTENING AT UPSTANDS AND PENETRATIONS

Upstands
System of fastening: spot fastening
The spacing (S) between two fasteners is determined using the same method as before. Maximum spacing : 33 cm
The flashing design must conform to national requirements

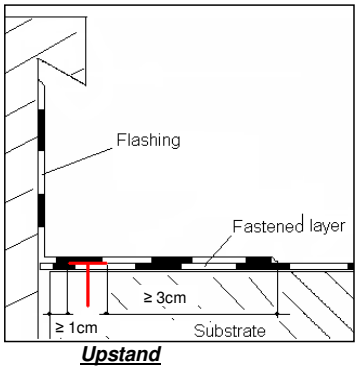
Penetrations
Fastener at every corner of the plate. Their design must conform to national requirements



Penetration



Rainwater outlet



Upstand

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