

# TESTUDO AGREEMENT "A" TESTUDO AGREEMENT "C"

WATERPROOFING SYSTEM FOR RAILWAY DECKS FOR HST HIGH SPEED LINES IN CONFORMITY WITH ANNEX VII OF THE ITALFERR SPECIFICATION, CONSISTING OF ELASTOPLASTOMERIC DISTILLED BITUMEN POLYMER WATERPROOFING MEMBRANES REINFORCED WITH POLYESTER SPUNBOND CONTINUOUS FILAMENT NON-WOVEN FABRIC

CATEGORY	CHARACTERISTICS			ENVIRONMENTAL						METHOD OF USE		
ELASTOPLASTOMERIC	WATERPROOF	REACTION TO FIRE	ECO GREEN	ASBESTOS FREE	TAR FREE	CHLORINE FREE	RECYCLABLE	NON DANGEROUS WASTE	EXHAUSTED OIL FREE	TORCH APPLICATION	HOT AIR APPLICATION	NAILING

## DESCRIPTION

The waterproofing system for application to the central zone of the deck between the low ballast retaining walls, which forms the bed of the high speed railway line, consists of two overlapping distilled bitumen polymer membranes (DBPM), the first layer being of 3 mm thickness called TESTUDO AGREEMENT "C" while the second layer is of 4 mm thickness and called TESTUDO AGREEMENT "A".

On the zone designed as a walkway, the waterproofing system consists of 4 mm TESTUDO AGREEMENT "A" membrane laid in a single layer. Both systems are designed to be covered by a hot laid bitumen conglomerate.

TESTUDO AGREEMENT "A" and TESTUDO AGREEMENT "C" are DBPM membranes in distilled bitumen polymer reinforced with isotropic polyester non-woven fabric, thermally stabilized and rot-proof, characterized by high mechanical strength, excellent elongation at break and puncture resistance.

The waterproofing compound coating the reinforcement, based on distilled bitumen, plastomers and elastomers, is flexible at low temperatures and strong at high temperatures, and has excellent resistance to ageing.

The lower face of both membranes is coated with the film Flamina, a thermofusible anti-adhesive film with high retraction on contact with flame, used for bonding the membranes to the substrate.

The upper face of TESTUDO AGREEMENT "C" is treated with "fine silk-screened talc" which enables the rolls to be unrolled easily, while the upper face of TESTUDO AGREEMENT "A" is coated with the textile finish Texflamina in preformed polymer fibres, which protects it from site traffic and asphalt operations. Both membranes have been tested by the Experimental Institute of the State Railways in Rome and have been homologated by the company Italferr-Iricav-Cavet.

TESTUDO AGREEMENT "A" and TESTUDO AGREEMENT "C" are membranes qualified as "Category 1" by the High Speed

Consortium, the company Italferr and the consortia with the contracts for the various sections of Italian railways.

The two-layer waterproofing system (TESTUDO AGREEMENT "C" + TESTUDO AGREEMENT "A") and the single-layer waterproofing system (TESTUDO AGREEMENT "A") have been certified for compulsory CE marking, which has been in force since 01/10/2011, in compliance with standard EN 14695 on reinforced bitumen membranes for waterproofing the decks of concrete bridges and other concrete surfaces subject to traffic where the waterproofing system is connected to the concrete deck and covered with asphalt.

## APPLICATION FIELDS

TESTUDO AGREEMENT "A" and TESTUDO AGREEMENT "C" are used in waterproofing protected by asphalt on the HST high speed lines, in a two-layer system in the central zone of the deck between the ballast retaining walls, and in a single-layer system on the walkways, in conformity with the provisions of ANNEX VII of the Italferr specifications. Both systems can also be used (protected by asphalt) for waterproofing decks subject to tyred traffic in accordance with the procedures specified in the specific INDEX publications: see Technical Specification no. 4 Bridges, viaducts and railway decks and Technical Specification no. 8 Parking.

**INTENDED USE OF "CE" MARKING SPECIFIED ACCORDING TO SITE**

**EN 14695 - REINFORCED BITUMINOUS MEMBRANES FOR WATERPROOFING THE DECKS OF CONCRETE BRIDGES AND OTHER CONCRETE SURFACES SUBJECT TO TRAFFIC**

- Under bituminous conglomerate
- TESTUDO AGREEMENT "A"
- TESTUDO AGREEMENT "C"

## CERTIFICATION



STATE RAILWAYS



BUREAU VERITAS



## METHOD OF USE AND PRECAUTIONS

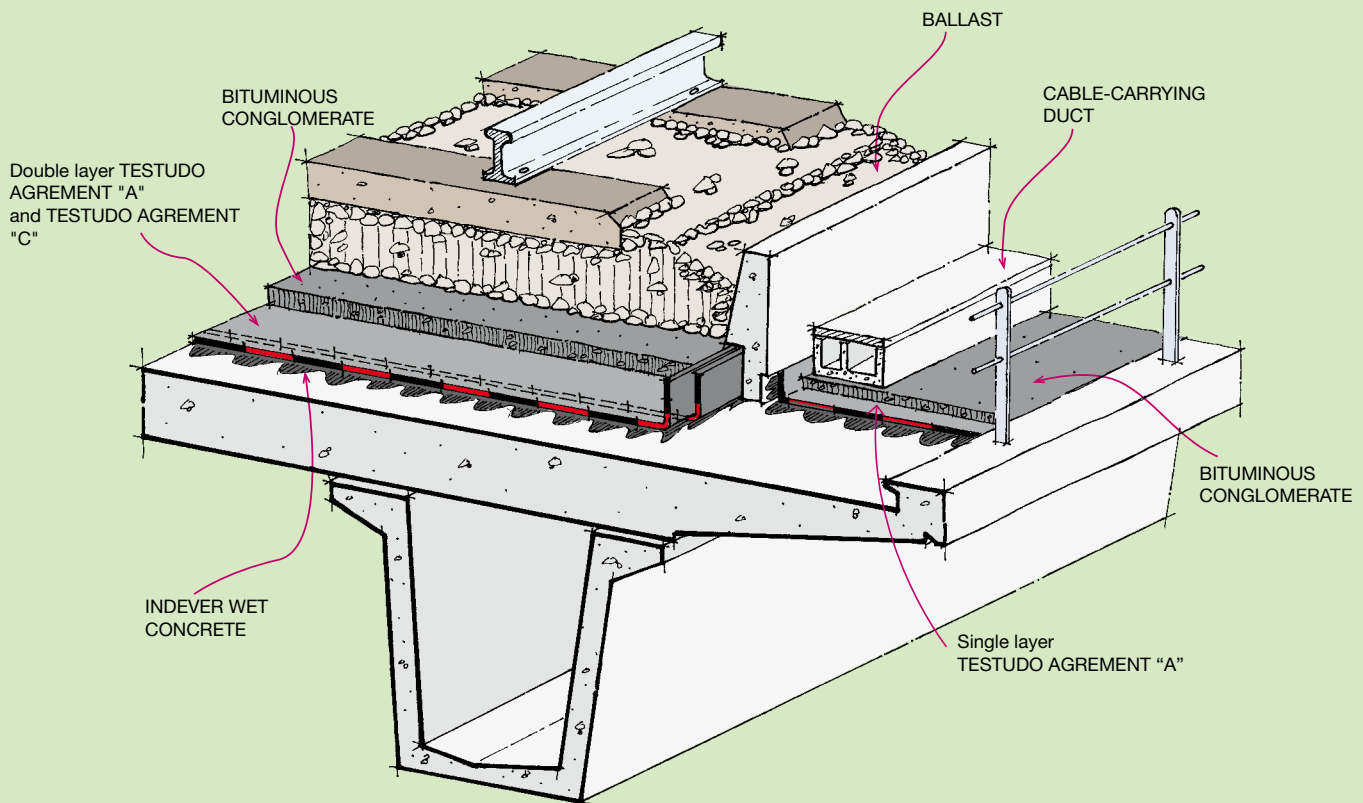
### Laying the two-layered waterproof covering on the central zone of the deck between the ballast retaining walls.

- The laying surface must be smooth, clean and dry. Any works to create an evenly laid surface must be conducted in compliance with the provisions of ANNEX VII of the Italferr specifications; different solutions must be accepted by it in advance.
- The entire surface to be covered will be treated with a 300-500 g/m<sup>2</sup> coat of INDEVER WET CONCRETE adhesion bituminous primer, a solution based on bitumen, additives and solvents, also suitable for damp bases and adhering to concrete with a force of  $\geq 0.2$  N/mm<sup>2</sup>, to be applied with a roller or sprayed on.
- The membrane must be applied in compliance with the procedure specified in ANNEX VII of the Italferr specifications, the sheets of the first layer, consisting of the **TESTUDO AGREEMENT "C"** membrane, placed transversely to the deck and overlapping each other by 10 cm, must be completely and thoroughly flame-bonded to the substrate and on the overlaps with complete adhesion, and turned up by 20 cm onto the ballast retaining walls. Across the overlaps of the first layer, the sheets of **TESTUDO AGREEMENT "A"** will be subsequently bonded with the same method and turned up by 25 cm onto the ballast retaining walls.

### Laying the single layer waterproof covering on the lateral walking areas of the deck between the ballast retaining walls and the kerbs carrying the railings:

- The preparation of the substrate and the application of the coat of primer must be carried out with the same methods as those specified for the central area according to ANNEX VII of the Italferr specifications.
- The membrane will be applied in compliance with the methods stated in ANNEX VII of Italferr specifications, the sheets of the **TESTUDO AGREEMENT "A"** membrane will be laid longitudinally to the deck, treated with the primer, with lateral and longitudinal overlaps of 15 cm, and must be completely and carefully bonded to the laying surface and on the overlaps with complete head-bonded adhesion. The upstands of the membrane onto the ballast retaining walls must be 20 cm while the upstands onto the kerbs carrying the railings must be 8 cm.

Special attention must be paid near the drain holes formed in the ballast retaining walls and near the drainpipes and the anchor holes for the electricity poles located on the walkways. The surfaces to be covered must be perfectly dry and no waterproofing operation must take place on rainy days, when it is snowing or when the ambient temperature in the laying phase is lower than +5°C. The functional tests, which will imply the tearing test for the membranes already laid, shall be carried out in compliance with the methods set in ANNEX VII of Italferr specifications and the areas subject to the tests must be restored with patches of the **TESTUDO AGREEMENT "A"** membrane sized 40x40 cm, torch bonded in compliance with the methods stated in the same ANNEX.



## TECHNICAL CHARACTERISTICS WITH REFERENCE TO THE ITALFER-IRICAV-CAVET SPECIFICATIONS

	Regulation	TESTUDO AGREEMENT "A"	TESTUDO AGREEMENT "C"
Thickness	8202/6	4 mm	3 mm
Mass per unit area	8202/7	≥4,1 kg/m <sup>2</sup>	≥3,1 kg/m <sup>2</sup>
Reinforcement		Polyester non-woven fabric Spunbond continuous filament	Polyester non-woven fabric Spunbond continuous filament
Mass of reinforcement per unit area		≥250 g/m <sup>2</sup>	≥140 g/m <sup>2</sup>
Stability of shape at 140°C	8202/18	Stable	Stable
R and B softening point of the mixture sampled from the impregnating tank	ASTM D36	150	150
Cold flexibility	8202/15	-15	-10
• after thermal ageing	8202/15	-10	-5
Lateral/end breaking load at tensile force	8202/8	≥900/900 N/50 mm	≥500/400 N/50 mm
Lateral/end elongation at tensile force	8202/8	≥40/40%	≥40/40%
Static puncture resistance	8202/11	PS5 (≥350 N)	PS5 (≥350 N)
Dynamic puncture resistance	8202/11	PD4	PD4
Lateral/end dimensional stability	8202/17	-0,5/+0,5%	-0,5/+0,5%
Lateral/end tear strength	8202/9	200/200 N	150/150 N
Impermeability to pressurised water	8202/21	500 kPa	500 kPa
UV QUV ageing resistance tester Astm/Ansi G53/77 (*)		Passes test	Passes test

(\*) Duration: 400 hours Test cycle: 4 hours condensation test at 40°C - 4 hours UV test at 60°C.

The values are determined according to UNI 8202. The tolerances over nominal values, where specified, are in accordance with European Directive UEAtc.

The membrane TESTUDO AGREEMENT "A" has been tested at the EXPERIMENTAL INSTITUTE OF THE STATE RAILWAYS IN ROME.



# TECHNICAL CHARACTERISTICS

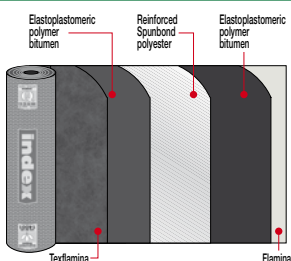
	Standard	T	TESTUDO AGREMENT "A"	TESTUDO AGREMENT "C"
Reinforcement			Polyester non-woven fabric Spunbond continuous filament	Polyester non-woven fabric Spunbond continuous filament
Thickness	EN 1849-1	±0,2	4 mm	3 mm
Roll dimensions	EN 1848-1	≥	1×10 m	1×10 m
Impermeability	EN 1928 - B	≥	60 kPa	60 kPa
Maximum lateral/end tensile force	EN 12311-1	-20%	1 100/1 000 N/50 mm	750/600 N/50 mm
Lateral/end tensile elongation	EN 12311-1	±10% V.A.	50/50%	50/50%
Lateral/end dimensional stability	EN 1107-1	≤	-0.5/+0.5%	-0.5/+0.5%
Cold flexibility	EN 1109	≤	-15°C	-10°C
• after ageing	EN 1296-1109	+15°C	-10°C	-10°C
High temp. slip resistance	EN 1110	≥	140°C	140°C
• after ageing	EN 1296-1110	-10°C	140°C	140°C
Reaction-to-fire Euroclass	EN 13501-1		E	E
External fire behaviour	EN 13501-5		F roof	F roof
Specific characteristics for laying under conglomerate (EN 14695)				
Dynamic impermeability	EN 14694	≥	500 kPa	500 kPa
Compatibility for thermal conditioning	EN 14691	≥	80%	80%
Adhesive force	EN 13596	≥	0.4 N/mm <sup>2</sup>	0.4 N/mm <sup>2</sup>
Resistance to shear stress	EN 13653	≥	0.15 N/mm <sup>2</sup>	0.15 N/mm <sup>2</sup>
Resistance to compaction	EN 14692		Passes test	Passes test
Water absorption	EN 14223	≤	1.5%	1.5%

In compliance with EN 13707 as a resistance factor to the passage of vapour across reinforced distilled bitumen polymer membranes, the value  $\mu = 20\ 000$  can be assumed where not declared.

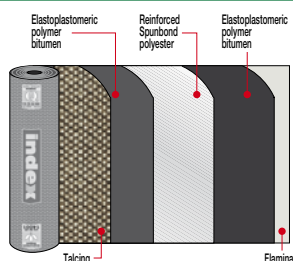
the numerous possible uses and the possible interference of conditions or elements beyond our control, we assume no responsibility regarding the results which are obtained. The purchasers, of their own accord and under their own responsibility, must establish the suitability of the product for the envisaged use.

## COMPOSITION OF THE MEMBRANE

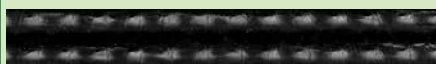
### TESTUDO AGREMENT "A"



### TESTUDO AGREMENT "C"



## PRODUCT FINISHING



**EMBOSSING FLAMINA.** The embossing on the lower surfaces of the membranes finished with Flamina film makes it possible to lay the product precisely and quickly, forming a smooth surface when melted with the torch. It indicates the correct melting temperature and lets the film retract faster. The embossing also enables optimal vapour diffusion; in spot bonded and loose laid installation, in the points where it remains intact, preventing blisters and swelling.



**"TEXFLAMINA" PP NON-WOVEN.** Multifunction, protection finishing material made up of a non-woven flame-melting synthetic-fibre fabric, coupled to the upper face of the membrane. It prevents coils from sticking to the roll, improves foot traffic resistance during installation, enhances the adhesion of paints, glues and extends their life.



**TALCIO SURFACING.** The talcing of the top face is carried out with a technique which evenly spreads the very thin talc over the top surface with a special pattern, preventing accumulation or zones without talc. This new system allow a quick unroll and gives the surface a pleasant aspect, which enable to torch it faster if compared to the other coarser mineral finishes.

The figures shown are average indicative figures relevant to current production and may be changed or updated by INDEX at any time without previous warning. The advice and technical information provided, is what results from our best knowledge regarding the properties and the use of the product. Considering

• FOR ANY FURTHER INFORMATION OR ADVICE ON PARTICULAR APPLICATIONS, CONTACT OUR TECHNICAL OFFICE • IN ORDER TO CORRECTLY USE OUR PRODUCTS, REFER TO INDEX TECHNICAL SPECIFICATIONS •

**index**  
Construction Systems and Products

Via G. Rossini, 22 - 37060 Castel D'Azzano (VR) - Italy - C.P.67  
T. +39 045 8546201 - F. +39 045 518390

Internet: [www.index-spa.com](http://www.index-spa.com)  
Informazioni Tecniche Commerciali  
[tecom@indexspa.it](mailto:tecom@indexspa.it)  
Amministrazione e Segreteria  
[index@indexspa.it](mailto:index@indexspa.it)  
Index Export Dept.  
[index.export@indexspa.it](mailto:index.export@indexspa.it)

