

KALIGARD

BRIDGE DECK WATERPROOFING





Product Development and Availability

Kaligard is the first membrane designed for use as a bridge deck waterproofing membrane encompassing the specific requirements laid down by Railtrack PLC and their approved contractors.

Kaligard was developed from one of our range of roofing membranes Kaliko SFbvLL and is manufactured by the same process used for the original Kaliko membrane, the original chemical formulation having been adjusted to provide better adverse weather welding properties as requested by contractors during its development.

The Kaligard fixing system was developed in co-operation with railway engineers and contractors whose experience of working on bridge waterproofing and repair contracts has made Kaligard simple to install. Heat welding techniques allow experienced contractors to install Kaligard successfully in the most adverse weather conditions.

Kaligard SFbv15 is a polyester reinforced PVC-P membrane providing high strength and stability for general bridge installation.

Kaligard Dbv15 is an unreinforced PVC-P membrane designed for possession work, installation in cold conditions at or below 0°C, areas where excessive movement can be anticipated and for the production of 'big sheets' where required.

The components required to install the system are available from our stocks both in the UK and Europe, membrane for larger contracts is manufactured to order requiring 4 weeks notice prior to a possession:

- ~~☞~~ Kaligard SFbv15 Polyester reinforced PVC-P
- ~~☞~~ Kaligard Dbv15 Unreinforced PVC-P
- ~~☞~~ Kaligard PVC-P faced metal profiles and sheets
- ~~☞~~ Kaligard liquid sealant

- ~~☞~~ CAP1000 polyester protection fleece
- ~~☞~~ CMC Galvanised metal profiles



System and components

Kaligard Fuel Oil and Diesel Proof PVC-P membrane

?? Dbv15 Diesel Proof PVC-P (Unreinforced)

?? SFbv15 Diesel Proof PVC-P (Reinforced)

?? Colours: Standard Black or Light Brown

?? Other colours available subject to conditions

Liquid joint sealant

VB14 PVC-P faced metal sheet and pre formed profiles

CAP1000 Polyester protection fleece

CMC Galvanised ballast guard profile

General application method

Track and ballast is removed in refurbishments and the exposed bridge deck is cleaned and prepared. The first CAP1000 protection layer is loose laid over the whole deck area. Joints and laps are heat welded to provide a continuous protected surface. Bespoke metal profiles are installed at perimeters and where required at changes of level. Kaligard PVC-P is loose laid over the prepared deck area and welded to the metal profiles. Movement joints, details, outlets and penetrations are sealed using unreinforced membrane, terminated by welding to bespoke PVC faced metal profiles. All welds and joints are tested by the sharp probe method then sealed with Liquid PVC where appropriate.

A second CAP1000 protection layer is laid over the installed Kaligard membrane with joints and laps heat welded to provide a continuous protected surface prior to the ballast being reinstated.

The actual application method and exact materials used depend upon the type of structure to be waterproofed; this 'General' application method should be treated as an example only.

Technical Data



Kaligard Bridge Deck waterproofing Membrane	Dbv15	SFbv15	SFbv20
Thickness mm	1.5	1.5	2.0
Width mm	1450	1500	1500
Roll length m	20	20	20
Mass g/m2~	1900	1900	2650
Tensile strength DIN 53455 N/mm2>	18/16		
Max. tensile force DIN 53354 N/50mm>		1100/1100	1100/1100
Max. tensile DIN 53455 %>	350/350		
elongation DIN 53354 %>		16/20	16/20
E-module 1 to 2% RAL-RG 717/1 N/mm2~	7	13	13
Resistance to tear propagation	DIN 53363 N/mm> DIN 53363 N>	100/90	
		220/220	220/220
Dimensional change after hot storage DIN 53377 6h/80 degrees C %<	1.5/+0.5	0.1-/+0.1	0.1-/+0.1
Behavior after hot storage DIN 53377 6h/80 degrees C			
Reduction in max. tensile elongation %~	2	2	2
Reduction in max. tensile strength %~	3	3	3
Reduction in weight %~	0.2	0.2	0.2
Aggressive liquid effects RAL/RG 717/1 10 days/23 degrees C			
Reduction in max. extension of tensile force %~	4	4	4
Reduction in max. tensile strength %~	4	4	4
Resistance to cold DIN 53361 degrees C>	-30	-30	-30
Lightfastness DIN 53389 Grade	8	8	8
Weather resistance DIN 53387 (XENON TEST T1200)	after over 10000 hours, no major change in resistance to tear or elongation		
Coefficient of water vapour diffusion DIN 16726 5.15	<15000	<12000	<12000
Resistance to damage by roots DIN 4062 4.7/5.7 Mechanical puncture rigidity RAL-RG717/1 Weldability RAL-RG717/1 Shear strength of seam bond RAL-RG717/1	no penetration of the film no perforation no penetration of water rupture away from joint seam		
Bond strength DIN 53357 N/50mm>	80	80	80

Key	Dbv15	Unreinforced PVC-P 1.5mm thick
	SFbv15	Polyester Reinforced PVC-P 1.5mm Thick
	SFbv20	Polyester Reinforced PVC-P 2.0mm Thick

Test Results 1996 Leipzig Institute for Building Technology



Lamington Viaduct completed October 1999
Workmanship and detailing conforms to RT/CE/C/001 1998

Working with the team from original specification to the completion of the possession this replacement concrete bridge was cast next to the existing metal bridge it was to replace. The Kaligard waterproofing System ballast and track were installed leaving only the bridge ends to be connected when the newly completed concrete structure slid into place as the metal bridge was removed.

The Kaligard Bridgedeck Waterproofing system is the most flexible system available, Fuel Oil and Diesel resistant PVC-P membranes produced to the most exacting standards and a fixing system designed for use in the arduous conditions met in possession work.

Testing to changing Railtrack standards is ongoing by Specification Services Limited and RAPRA Technology Limited.

Due to the specialist nature of these projects, the inherent safety factors and the techniques employed, only contractors approved by Kaltek Systems Limited and being fully conversant with Railtrack safety codes install the Kaligard System.



**RAILTRACK LINE SPECIFICATION
RT/CE/S/041/1A December 1997 and APRIL 1998
WATERPROOFING SYSTEMS FOR UNDER LINE BRIDGE
DECKS**

SYSTEM QUALIFICATIONS CERTIFICATION

**Membrane
RAPRA Technology Ltd
CTR 32621**

**Ballast Penetration
Specification Services Ltd
SS 00056**

Membrane and System Testing for qualification under RT/CE/S/041-1/1A carried out by RAPRA Technology Limited and Specification Services Limited February to September 1998.

Kaligard Dbv, SFbv and SFbvSK PVC-P membranes are produced under licence in the EEC by ISO 9000 certified manufacturers

Development of Kaliko SFbv by Goppinger Kaliko GmbH
Development of Thermoplan D by Thermoplast Bernsdorf GmbH

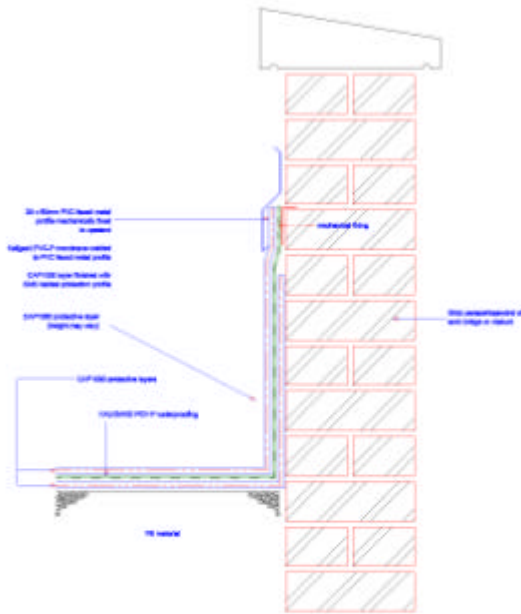
Development of The Kaligard System by

Kaltek Systems & CMC Industrial Services

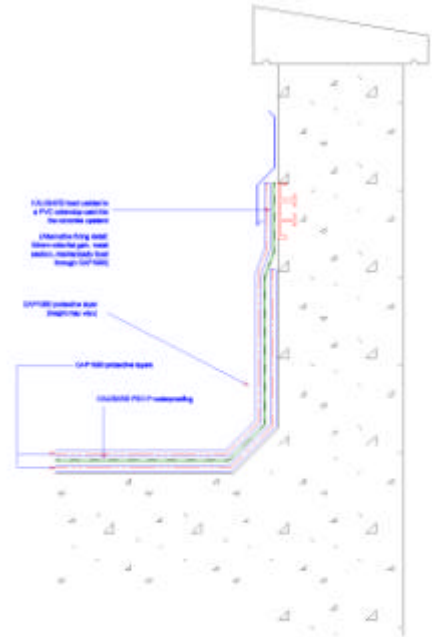
Certification for DIN Standards by MFPA Leipzig



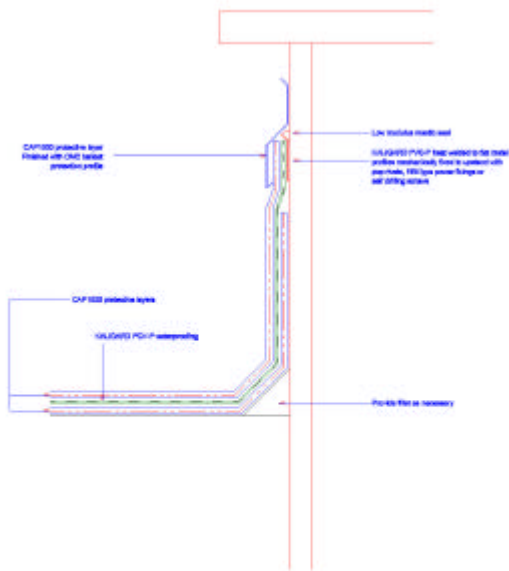
Standard Detail Drawings



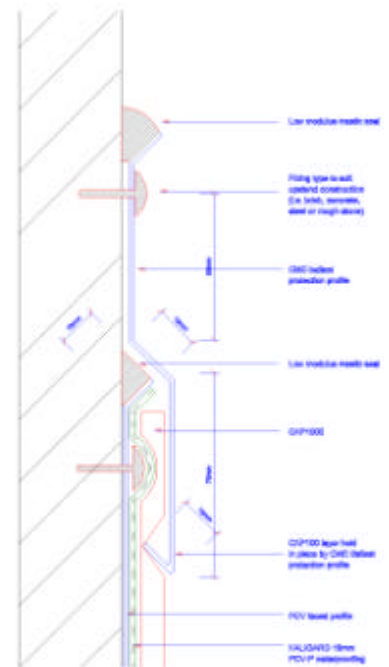
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	Drawing Code: 00100000000000000000			



 BRIDGE SEAL WATERPROOFING	Rev:	Jan 2008	Scale:	1:5
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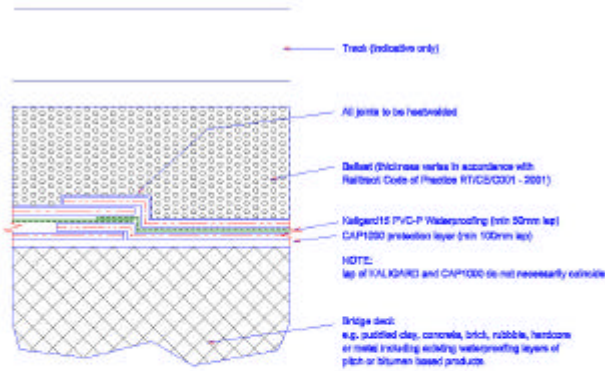
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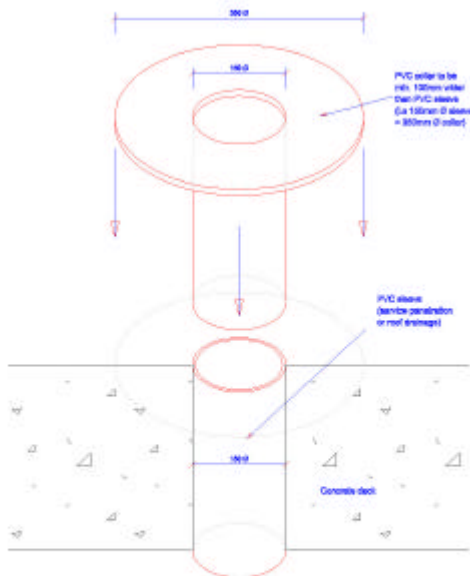


Standard Detail Drawings



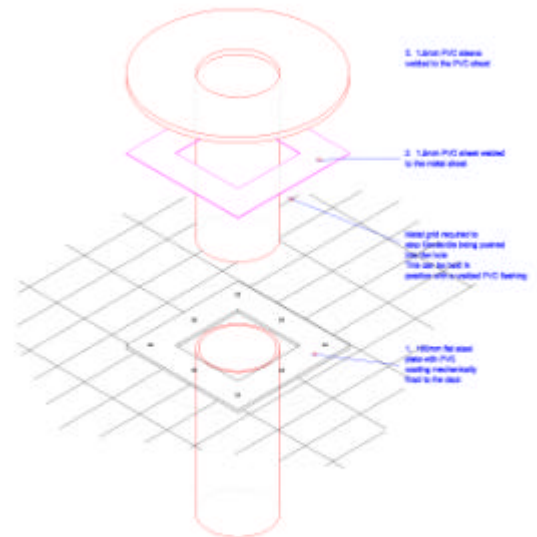
Bridge Deck
Sandwich Construction

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Drawing No.: Bridge Deck - Sandwich Construction		



New Concrete Deck
Sleeve Detail

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	Issue:	Checked by:
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	Scale:	Sheet of:
Drawing No.: Sleeve Detail - New Concrete Deck		



Refurbishment of Existing Deck
Sleeve Detail

	Date:	Rev:
	Issue:	Checked by:
	Drawn by:	Checked by:
	Scale:	Sheet of:
Drawing No.: Sleeve Detail - Refurbishment		

Confidential Technical Report 32621

Date: 25 November, 1998

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PROJECT NO: E0443

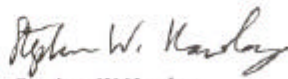
**TESTING OF ONE MEMBRANE USED AS A LOOSE-LAID SYSTEM TO
RAILTRACK LINE STANDARD RT/CE/S/041 ISSUE 1, DECEMBER 1997**

KALTEK SYSTEMS LIMITED

Unit 3, Bowers Yard
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For the attention of Mr P Langham-Morris


PC RAND GROOM
M.P. Stickley
Author


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Physical Testing

Page 1 of 23 pages – CTR 32621

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BS EN ISO 9001
Cert. No. FS 32740



Material Data, Limitations and Application Guide in accordance with
RT/CE/S/041 issue 2 - 2001

The system (Type, components, limitations and data)

- ?? Kaligard PVC-P is a 1.5mm thick diesel, bitumen and fuel oil resistant membrane manufactured by the calendar process, delivered to site in standard roll sizes 1.5 metre wide x 30 metre long. Kaligard is produced using modified plasticiser and advanced polymers to allow welding to be carried out at low temperature.
- ?? Kaligard PVC-P retains its weldability throughout its working life; it does not have a shelf life and does not require any special activation after exposure to the atmosphere.
- ?? CAP 1000 is a 10mm thick polyester protective layer installed below and above the waterproofing layer to provide protection from sharp protrusions from the deck and to resist abrasion and ballast penetration from above.
- ?? The Kaligard Bridge Deck waterproofing system is a loose laid system for waterproofing bridges with a fully supporting deck in adverse weather conditions. The main elements of the system, Kaligard PVC-P sheet, Kaligard PVC faced profiles and CAP 1000 protection layer are jointed using the heat welding process ensuring that bad weather and low temperature have a minimal effect on installation time during a possession contract.
- ?? Kaligard is effectively without limitation under the terms of RT/CE/S/041 having already been installed successfully in the most adverse conditions since December 1996.
- ?? The Kaligard system is usually applied to bridge decks as a loose laid system suitable for both new and refurbishment projects.
- ?? Kaligard 'Big Sheets' are fabricated off site and delivered folded on time critical possessions increasing the speed of installation.
- ?? Kaligard PVC-P is successfully installed on any supportive surface in almost any weather conditions and often replaces sprayed or fully bonded systems for possession contracts.



Application Guide - Preparation

- ?? The substrate should be free from sharp protrusions, which could damage the waterproofing or penetrate the CAP 1000 protective layer. Where the surface is broken or extremely deformed sand or ballast blinding should be laid to even out the surface.
- ?? Prepare drainage sumps for waterproofing installing Kaligard metal profiles as required.
- ?? Install Kaligard PVC faced metal profiles at existing cast in water outlet points where appropriate, and ensure that other drainage points within the deck area are free from blockages ready to be sleeved.

Application

- ?? Loose lay CAP1000 sheet protection layer over the area to be waterproofed allowing an overlap of 100 mm minimum at laps and joints. The CAP1000 protection layer should closely follow the angle and shape of the upstand and terminate approximately 50mm below a cast in water stop.
- ?? Where a Kaligard chase termination profile is specified the CAP1000 protection layer can be trapped behind the profile as it is mechanically fixed to the upstand.
- ?? Heat weld all laps and joints, with a hot air welding gun and silicone pressure roller, to prevent slippage and voids forming as the area is trafficked.
- ?? Where CAP1000 over sails an outlet or sump, cut through the protection layer to allow prepared profiles to be installed and fixed to the deck where necessary.
- ?? Loose lay Kaligard PVC-P waterproofing layer over the prepared surface allowing an overlap of 50mm minimum at all laps and joints. Heat weld all laps and joints using a hot air welding gun and silicone pressure roller - temperature of the nozzle to be determined by test welding on site.
- ?? Test all laps and joints by the sharp probe method to ensure that the weld is complete throughout its length. When heat welded joints and laps have been tested and approved seal with a liquid PVC bead where necessary.



- ?? At prepared water outlets and sumps Kaligard PVC-P is heat welded a to the installed profiles or bespoke Kaligard sleeves using a hot air gun and silicone roller
- ?? Particular care should be taken where end and side laps coincide and produce a three-layer joint. All facets of the joint should be rolled with an even pressure so that no capillary is left unsealed.
- ?? Heat weld Kaligard PVC-P flashing membrane to the cast in PVC water stop or PVC faced metal termination profile, dress the flashing membrane down and over the waterproofing allowing an overlap of at least 50mm at deck level and heat weld the joint with a hot air gun and silicone pressure roller
- ?? Test all laps and joints at details and penetrations by the sharp probe method to ensure that the weld is complete throughout its length.
- ?? When heat welded joints and laps have been tested and approved seal with a liquid PVC bead where necessary.
- ?? Loose lay CAP1000 sheet protection layer over the waterproofed area allowing an overlap of 100 mm minimum at laps and joints. The CAP1000 protection layer should closely follow the angle and shape of the waterproofing and terminate approximately 50mm above the upstand termination.
- ?? Heat weld all laps and joints, with a hot air welding gun and silicone pressure roller, to prevent ballast forcing joints to part and allow ballast beneath the protection layer.
- ?? Mechanically fix the CMC 0.7mm thick galvanized ballast protection profile to the upstand, above the waterproofing termination profile, trapping the CAP1000 protection layer with the bottom hook return.
- ?? Ballast should be carefully introduced at the base of the upstands before machine filling begins over the flat area of the bridge to ensure that the protection layer is not pulled away as machinery runs onto the deck. Ballast type and thickness should be in accordance with Railtrack specification and in general should not be less than 300mm thick. In areas where ballast thickness falls below 300mm a double layer of CAP 100 is required **above** the Kaligard PVC-P waterproofing layer.



Patching & Repairs

- ?? Damaged Kaligard PVC-P can be easily repaired and when complete the joint of the repair with the original waterproofing stronger than the sheet itself.
- ?? Damaged Kaligard PVC-P should be cut back to provide a regular shape and removed.
- ?? An area of sheet approximately 100 mm larger than the area to be patched should be wiped clean using a dry cloth ready to receive a patch of new Kaligard PVC-P.
- ?? A new piece of Kaligard PVC-P should be laid onto the existing sound material overlapping the area to be repaired by at least 50mm.
- ?? The patch is welded to the existing material using a hot air gun and silicone roller and when complete the weld should be tested by the sharp probe method. Once tested and approved the CAP1000 protective layer should be patched in a similar fashion but allowing an overlap of 100 mm.

Storage and handling

- ?? Rolls of Kaligard PVC-P and CAP1000 should be stored horizontally and if possible be kept in a relatively dry area prior to use.
- ?? Rolls of Kaligard or Kaligard Big Sheets should not be dragged over rough surfaces or sharp projections.
- ?? Kaligard PVC faced metal profiles and CMC galvanized profiles should be stored where they can be protected from mechanical damage.

Health & Safety

- ?? The components of the Kaligard are effectively inert and in themselves pose no risk to health.
- ?? Kaligard PVC-P rolls, Big sheets and CAP1000 rolls are heavy and should be handled carefully.
- ?? Kaligard and CMC metal profiles may have sharp edges and should be handled carefully when working on or close to the waterproofing layer.



- ?? Kaligard PVC-P has a smooth finish and may become slippery when wet or after a frost. Care should be taken when walking across waterproofed areas prior to the installation of the final CAP1000 protective layer.
- ?? During the installation electrical cables feeding heat guns, task lighting and generators will lay over the working area therefore personnel should be careful when walking particularly near working heat guns.

Mechanical properties

The physical performance and life expectancy of Kaligard PVC-P Bridge deck waterproofing membrane is not effected by exposure to ultra violet light, ozone, water, fuel oil, diesel fuel, polystyrene, bitumen or bituminous products.

Packaging and labelling

All components forming part of the Kaligard System carry information labels applied by their manufacturer. There is no 'use by date' applicable to any standard component of the Kaligard System.

Protection Layers

All standard protection layers commonly used in track maintenance by Railtrack Plc and their contractors are suitable for use with Kaligard in addition to CAP1000 Railtrack approved protection fleece. e.g. Servicised protection Boards, self adhesive modified bitumen felts and Regupol reconstituted rubber sheet.



COSHH

Sheet Cleaner and PVC-P Liquid Joint Sealant are solvent based, flammable liquids having a low flash point. They should be stored in a locked container suitably marked. Smoking, naked flames, sparks etc. are forbidden in their proximity. They should be kept out of strong sunlight as this could cause sealed containers to split. If a cleaning or sealing operation is carried out in an enclosed space, adequate ventilation must be provided. Solvent vapours can cause dizziness or sickness if inhaled; in this event the operator must be taken into the fresh air and encouraged to breathe deeply and appropriate medical advice taken.

Additional safety information is contained in COSHH information sheets provided for all hazardous materials used in the installation of the Kaligard Bridge Deck Waterproofing System.

Accidental spillage of solvent-based components should be controlled using dry sand to absorb the liquid and the resulting contaminate disposed of safely under the direction of the site supervisor.

Safety on Site

Only Approved Contractors whose employees have received training in the safety requirements and laying techniques employed are able to install the Kaligard Bridge deck Waterproofing System. Additional safety training is required to qualify for work on any Rail project.

The Membranes and Components used in the Kaligard Bridge deck Waterproofing System are supplied through Authorised Contractors only by:

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Any Time Any weather On time Every Time