FIRE STOP JOINT

08

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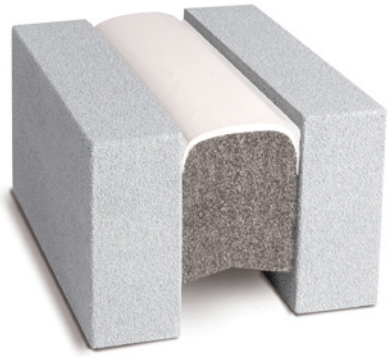
CFS ROPE SEAL



roperties

The CFS Rope Seal rope seal is made of fireproof, rotproof mineral fibres wrapped in a network of glass threads. It is cylindrical and very flexible and easy to handle. It is unaffected by water and humidity, and also resistant to most aggressive chemicals and micro-organisms.

CFS Rope Seal rope seals have been granted fire ratings for use in linear expansion joints in the horizontal and vertical positions (certificates available on request).

Domains of application

The CFS Rope Seal is used:

- For the treatment of horizontal and vertical joints requiring fire protection: floor, wall, and ceiling joints; joints between precast outside wall elements; joints between floor nosings and precast outside walls.
- For fire protection partitions, openings for ducts and pipes, utility ducts, protection of neoprene bearings.
- Stopping of joints at stopped ends, fire protection treatment between floor and curtain wall.

- **Recommended with CFS shear dowels and CVS stair connectors.**

CFS Rope Seal effectively protect buildings and other structures: hospitals, industrial and office buildings, housing, hotels, shopping centres, parking garages, primary and secondary schools, airports, stadiums, etc.

Application

Placement of CFS Rope Seal:

Installing CFS Rope Seal is easy, rapid, and economical. As in the tests performed, it is best to use LITACOLLE with connecting SILICA FELT and to follow the installation instructions corresponding to the initial opening of the joint:

- For a joint having an initial opening between 10 and 120, follow installation instructions no. 1.
- For a joint having an initial opening greater than 120mm and less than or equal to 200mm, follow installation instructions no. 2.

Water-tightness - protection on the side not exposed to fire: Floor, wall, and ceiling expansion joints may require additional protection. If needed, water-tightness can be achieved by filling the top of the joint with a silicone mastic (TECHNIQUE BETON SN) or polyurethane mastic (TECHNIQUE BETON MP50 CL and MPR) or by using an EPDM membrane (TECHNIFLEX). The expansion joint can be closed off by a joint batten, a flexible blanking shape, or a mechanical seal.

Water-tightness - protection on the side exposed to fire: Here, VEDAFLEX SIL F mastic should be used.

Performance

CFS Rope Seal complies with the latest European regulations and standards:

- Administrative order of 22 March 2004,
- Fire classification standard NF-EN-13501-2 of May 2004,
- Fire resistance testing standard NF-EN-1366-4 of November 2006 and its appendix A1 of June 2010.

Horizontal expansion joints:

- single rope seal/installed from the upper surface with a classification:
  * EI 240-H-M20-B-W10 to 120 without mastic (certificate RS10-103),
  * EI 240-H-M20-B-W10 to 200 with joint batten,
- double rope/installed on the underside with a classification:
  * EI 120-H-M20-B-W20 to 60 with VEDAFLEX SIL F mastic,
- single rope seal/installed on the underside with a classification:
  * EI 240-H-M20-B-W80 to 120 with VEDAFLEX SIL F mastic,

Vertical expansion joint:

- single rope seal/installed by the unexposed side:
* EI 240-V-M20-B-W20à120 without joint battens
- double rope seal/installed from the exposed side:
* EI 120-V-X-B-W20à60 s with VEDAFLEX SIL F mastic,
* EI 240-V-X-B-W80à120 with VEDAFLEX SIL F mastic,

Key:
EI x: Tightness and thermal insulation for x minutes.
H or V: position of the joint - Horizontal or Vertical,
Mx: x% lateral displacement of the joint

X: no lateral displacement of the joint,

B: splices prefabricated in the plant and on site,
W: width of joints (in mm).

Safety

Refer to the safety data sheet.

Storage

Away from moisture, in its original packaging.

Packaging

CFS Rope Seal is available in various diameters from 12mm to 180mm. The rope seals are stored in rolls in plastic bags

having capacities: ϕ12: 50ml; ϕ20 à ϕ40: 30ml; ϕ50 à ϕ60: 25ml; ϕ70 à ϕ80: 20ml; ϕ90: 18ml; ϕ100: 10ml; ϕ120 à ϕ180: 2x2ml

Reminder of the regulation in force

The regulation concerns fire protection systems for the caulking of linear joints (expansion joints, stopped ends, nosings of floors, curtain walls, etc.).

- Administrative order of 22 March 2004 (Ministry of the Interior) concerning the fire resistance of products, elements of construction and of structures. This order introduced the establishment of European standards and abrogated the order of 3 August 1999.

  Before the administrative order of 22 March 2004, fire protection ropes or slabs were the object of test reports specific to each laboratory.

  Standards now define the experimental framework of these tests and the classification of fire resistance that results therefrom.

- Fire classification standard NF EN 13501-2 (May 2004): Fire classification of construction products and building elements. This standard defines the testing conditions: orientation of the fire, displacement (movement) capability, types of splice, width of the joints, etc.)

- Testing standard EN 1366-4 (November 2006) + A1 (June 2010 extension): Fire resistance tests of service installations.

  Part 4: Linear joint seals.
  This testing standard defines a method for determining the fire resistance of linear joint seals with respect to the end use for which they are intended, with or without displacements induced by mechanical actions.

  This testing standard was adopted by the European Standardization Committee (CEN) on 17 April 2006, then approved as a French Standard on 5 October 2006, to take effect on 5 November 2006.

Direct consequences of the regulation:

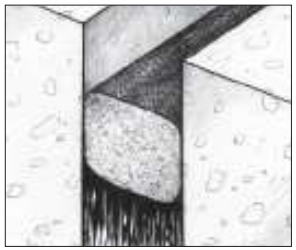
By definition, fire resistance test reports written by the various laboratories before November 2006 could not make reference to standards that did not exist at that time. They are therefore obviously not compliant with the current regulation and are no longer valid. Only a classification certificate, valid for 5 years from the date of testing, established by an approved laboratory, is valid.

Today, 10 years after the publication of the Ministerial order of 22 March 2004 and more than 5 years after the coming into force of standard 1366-4, many construction companies and inspection organizations fail to apply or to require the application of the regulation, even for public projects.

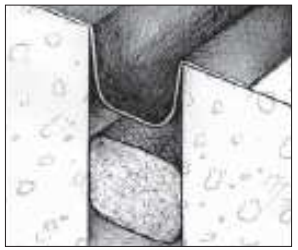
Test reports established before 5 November 2006 do not satisfy the requirements of Standard EN-1366-4 and are not compliant with the regulation. The use of fire protection products and systems not compliant with the regulation would lead inevitably to penalties if there were a fire.

Examples of application of CFS Rope Seal

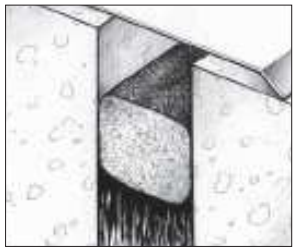
Expansion Joints:



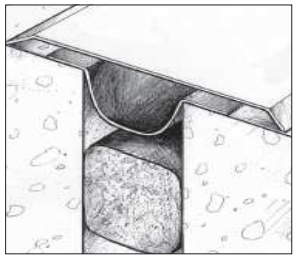
CFS fire protection rope seal in an expansion joint



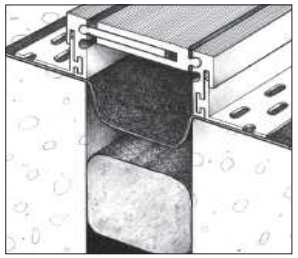
CFS fire protection rope seal with membrane



CFS fire protection rope seal with joint batten

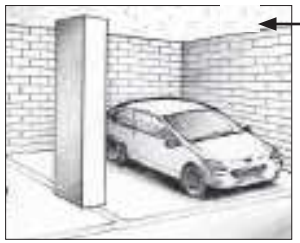


CFS fire resistant rope seal with membrane and joint battens

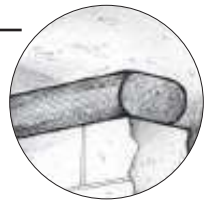


CFS fire resistant rope seal with membrane and mechanical joint

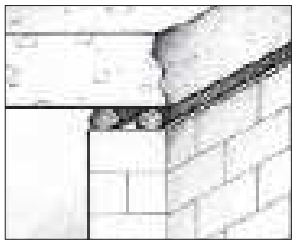
Stopped ends: The size of the joint may make it necessary to use two rope seals to attain the desired fire protection on both sides.



Application in parking garage



Application of a single rope seal on stopped end



Application of two single rope seals on stopped end

Between a floor and a curtain wall:

Technical characteristics and properties of CFS Rope Seal

Characteristics:

		Designation	Value	Unit	Standard
Classification Fire resistance	Non-combustibility	-	Class A1	-	DIN 4102
	Melting temperature	-	>1000	°C	DIN 4102/T17
Service temperature		-	<780	°C	DIN 52271
Water- and vapour-tightness		μ	1.4	-	DIN 5252615
Heat capacity		Cp	840	J/kgK	-
Grade AS	Insulation of austenitic steel				AGI Q 135

Thermal properties:

Thermal conductivity at mean temperature	Tm	50	100	200	300	400	500	°C	DIN 52612
	-	0.041	0.049	0.073	0.096	0.136	0.144	W/mK	

The Lambda value of CFS rope seals is approximately 0.035W/mK at 10°C and 0.040W/mK at 50°C.
The thermal resistance or R value (m² K/W) is calculated as the ratio of the thickness of insulation to Lambda.

Thermal properties:

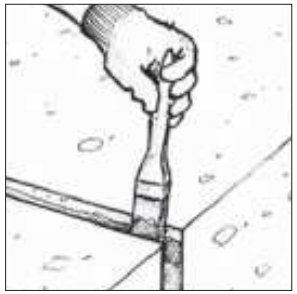
References of the elements tested	Test	Load F applied (kN) and joint diameter Øc (mm)	Compressibility	Immediate shape recovery	Shape recovery After 2h	Shape recovery After 72h
CFS Rope Seal Ø60	1	F = 4 kN Øc = 16mm	69%	83%	88%	90%
	2	F = 50 kN Øc = 8mm	83%	78%	84%	86%
	3	F = 5 kN Øc = 16mm	70%	76%	87%	91%
Mean			**74%**	**79%**	**86%**	**89%**
CFS Rope Seal Ø100	1	F = 30 kN Øc = 16mm	81%	55%	69%	74%
	2	F = 30 kN Øc = 17mm	80%	62%	69%	71%
	3	F = 30 kN Øc = 14mm	85%	57%	62%	63%
Mean			**82**	**58%**	**67%**	**69%**
CFS Rope Seal Ø150	1	F = 100 kN Øc = 19mm	86%	54%	55%	72%
	2	F = 100 kN Øc = 17mm	88%	56%	57%	67%
	3	F = 100 kN Øc = 17mm	88%	68%	71%	81%
Mean			**87%**	**59%**	**61%**	**73%**

Acoustic property of CFS Rope Seal:

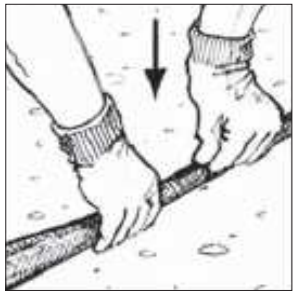
Acoustic absorption (Ds) versus frequency (Hz) for diameters from 30 to 170mm	125	250	500	1000	2000	4000	Internal measurement
	0.1	0.16	0.38	0.51	0.59	0.61	

Installation instructions no. 1: CFS Rope Seal fire protection system for joints having initial openings from 10mm to ≤120mm

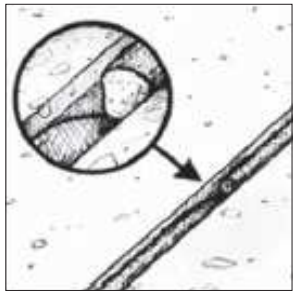
If necessary, remove the packing (polystyrene, cellular cardboard, etc.) from the joint body and clean its walls. To promote good bonding of the glue, eliminate dust from the edges of the slabs using a brush or a broom.



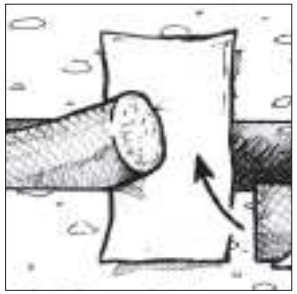
Apply LITACOLLE glue to both sides of the joint



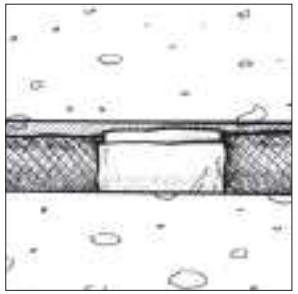
Before the glue dries, force the CFS rope seal into the joint



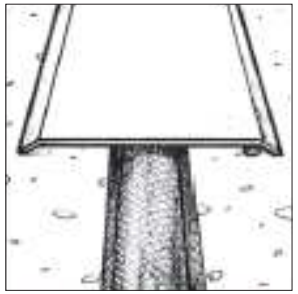
Joining of two lengths by overlap of 100 to 150mm **for the 12mm diameter only**.



Butting of two lengths with the SILICA FELT over a width of at least 300mm and a height = perimeter + 100mm



Force the splice into the joint.



Batten optional

Consumption of LITACOLLE:

- Horizontal application: from 400g/m² to 800g/m². The consumption for a rope seal will then be approximately:
  - CFS Rope Seal Ø12-20mm: from 20g to 40g per ml for both sides,
  - CFS Rope Seal Ø30-40mm: from 40g to 80g per ml for both sides,
  - CFS Rope Seal Ø50-80mm: from 60g to 120g per ml for both sides,
  - CFS Rope Seal Ø90-120mm: from 80g to 160g per ml for both sides,
  - CFS Rope Seal Ø150-180mm: from 100g to 120g per ml for both sides,
- Vertical application: from 800g/ml to 1600 g/ml to attach the rope seals securely in this position.

Condition of validity of the fire resistance system:

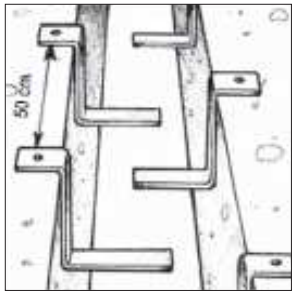
LITACOLLE and the silica felt for the joins are an integral part of the fire protection system.

It is therefore mandatory to:

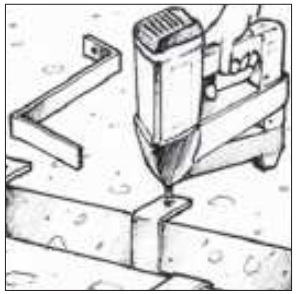
- Bond the CFS Rope Seal with LITACOLLE to prevent their falling out when there are movements of the joint.
- Gluing the flap of the SILICA FELT over a width of 30mm to close the butt splice securely. The splice is then forced into the joint, the slab sides of which have been impregnated with LITACOLLE.

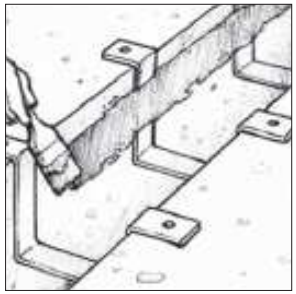
Installation instructions no. 2: CFS Rope Seal fire protection system for joints having initial openings from >120 to ≤200mm

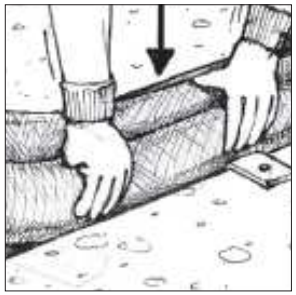
If necessary, remove the packing (polystyrene, cellular cardboard, etc.) from the joint body and clean its walls. To promote good bonding of the glue, eliminate dust from the edges of the slabs using a brush or a broom.

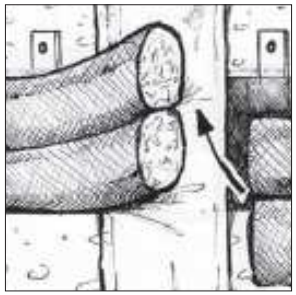


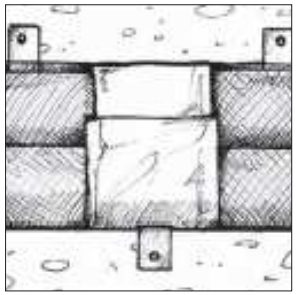
Position the brackets in a 50-centimetre staggered array

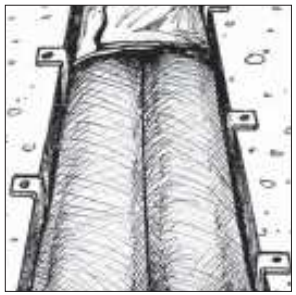

Attach the brackets using a pneumatic nail gun

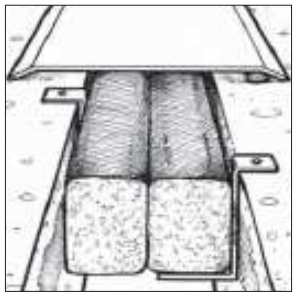

Apply glue to both sides of the joint

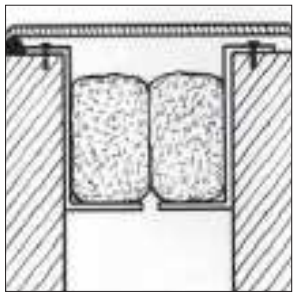

Before the glue dries, force the CFS Rope Seal into the joint


Butting two lengths with SILICA FELT over a width of at least 300mm


Force the splice into the joint.


CFS Rope Seal in place


Protecting joint batten


Detail: joint battens bonded or attached with screws and anchors

Extract from the test certificate
Validity/Conditions of installation/Fire protection classification

All of the results presented below are valid for a level of compression of the CFS Rope Seal of at least 33%, except for the 12mm rope, for which the level of compression is 20%.

Rope seal diameter ≥1.5 x width of joint

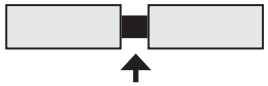
1/ Horizontal expansion joint:

Extract from classification report RS 10-103, valid until 27/09/2015
Extract from CSTB certificate RS08-162/A, valid until 15/12/2015

Conditions of installation:
- Standard and earthquake-rated joints (max. 20% lateral displacement allowed).
- Installation from the upper surface of the slab,
- Installation from the side away from fire

Orientation of the joints: horizontal and stopped ends Only the tested positions are validated:

Rope seal 12mm in diameter



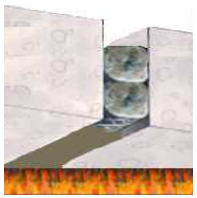
Rope seal >12mm in diameter

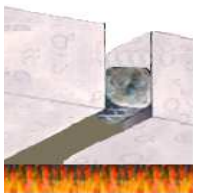
Rope seal >100mm in diameter

Performance:

EI 240 – H – M20 – B – W20 to 120, without mastic, without joint batten,
EI 240 – H – M20 – B – W 20 to 200, without mastic, with joint battens bonded with TECHNIQUE-BETON-SN over 50mm from the edge of the slab, on a single side. The cover profile will be offset at least 350mm from the CFS Rope Seal splices.

Extract from CSTB certificate RS11-102/A, valid until 01/12/2016
Extract from CSTB certificate RS12-028/B, valid until 16/04/2017

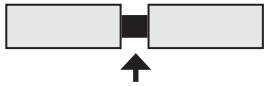




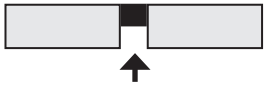
Conditions of installation:
- Standard and earthquake-rated joints (max. 20% lateral displacement allowed),
- Installation from the underside of the slab,
- Installation from the side towards fire,
- Rope seal recessed 1.5mm from the surface,
- VEDAFLEX SIL F mastic must be used to fill the space between the inner surface of the joint and the underside of the slab,
- Number of rope seals:
  - 2 rope seals for joints from 20 to 60mm, with rope seal splices staggered by at least 700mm between the upper rope and the lower rope,
  - 1 rope seal for joints from 80 to 120mm.

Orientation of the joints: horizontal and stopped ends

Position tested:



Other validated positions:

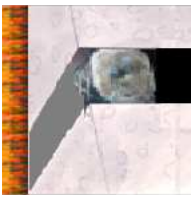


Performance:

EI 120 – H – M20 – B – W20 to 60 with VEDAFLEX SIL F mastic, without joint batten,
EI 120 – H – M20 – B – W80 to 120 with VEDAFLEX SIL F mastic, without joint batten.

2/ Vertical expansion joint:

Extract from EFECTIS certificate no. 12-A-580, valid until 12/06/2017
Extract from EFECTIS certificate no. 12-V-583, valid until 12/06/2017

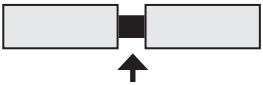


Conditions of installation:

- Static joints only
- Installation from the side exposed to fire,
- Rope seal recessed 15 to 20mm from the surface of the concrete,
- VEDAFLEX SIL F mastic must be used to fill the space between the inner surface of the joint and the surface of the concrete (a thickness of 15 to 20mm).
- Number of rope seals:
  - 2 rope seals for joints from 20 to 60mm, with rope seal splices staggered by at least 700mm between the upper rope and the inner rope.
  - 1 rope seal for joints from 80 to 120mm,

Orientation of the joints: vertical only.

Position tested:



Other validated positions:

Performance:

EI 120 – V – X – B – W 20 to 60 with VEDAFLEX SIL F mastic, without joint batten,
EI 240 – V – X – B – W 80 to 120 with VEDAFLEX SIL F mastic, without joint batten.

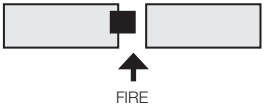
Extract from EFECTIS certificate no. 11-A-441, valid until 25/07/2016

Conditions of installation:

- Standard and earthquake-rated joints (max. 20% lateral displacement allowed),
- Installation from the side not exposed to fire,
- Single rope seal recessed 15 to 20mm from the non-exposed side of the concrete,

Orientation of the joints: vertical only.

Only the tested positions are validated:



Performance:

EI 240 – V – M20 – B – W20 to 120 without mastic, without joint battens.

EI 240 – V – M20 – B – W20 to 120 without mastic, with stainless steel or aluminium joint battens placed on the non-exposed side, EI 240 – V – M20 – B – W20 to 120 without mastic, with membrane on the non-exposed side,

EI 240 – V – M20 – B – W20 to 120 without mastic, with membrane and stainless steel or aluminium joint batten on the non- exposed side.

To obtain an EI 240 classification without mastic for both side of the shell, simply install a rope seal on each side as described above.

If it is desired to close the joints on both sides, it will then be necessary to use VEDAFLEX SIL F mastic, because both sides will then be exposed to fire (Extension EFR-14-001872 of certificate no. 11-A-441).