MAPEI

Mapefix EP 470 Seismic

Fast Track Ready

Pure epoxy resin-based chemical anchor for structural loads

OP7: non cracked concrete	OP1: cracked and non cracked concrete	C2: Seismic performance	Rebar: post installed rebar
M8 ÷ M30	M12 ÷ M24	M16 ÷ M24	Ø8 ÷ Ø32

WHERE TO USE

Mapefix EP 470 Seismic is an adhesive used to chemically anchor metal bars in holes made in building materials. It is a two-component, solvent-free product made from pure epoxy resin. **Mapefix EP 470 Seismic** is supplied in 470 ml cartridges and has been specifically developed to chemically anchor steel and galvanized steel components, threaded bar and rebar in order to transmit structural loads to solid substrates such as concrete, lightweight concrete, stone, wood and compact masonry. Specific also for anchoring metal bars in tension and compression zones in cracked and non-cracked concrete, including in areas at risk of seismic activity.
Also, because no stress is generated as with conventional mechanical expansion fasteners, it is also an ideal solution for anchoring close to edges or when there is limited distance between each anchor.
The epoxy formulate of **Mapefix EP 470 Seismic** gives the resin extended workability time (see table 1), which makes it particularly suitable when anchoring operations are carried out in hot climates or if work has to be interrupted.
Mapefix EP 470 Seismic is recommended for all types of anchoring with a horizontal, vertical, inclined or overhead axis in tension and compressed zones subjected to static or dynamic stress or loads caused by seismic activity.
Mapefix EP 470 Seismic hardened may also be used for immersed anchoring which are permanently damp, in marine and industrial environments and in areas subjected to aggressive chemicals. It may be applied at temperatures between +5°C and +40°C, including on damp or wet substrates and in holes immersed under water.
Mapefix EP 470 Seismic may be applied in rough holes made with a hammer drill, and may be used for anchors with both small and large crowns.

Mapefix EP 470 Seismic is recommended for anchoring elements in place, such as:
- strengthening rods in construction joints;
- immersed anchors and anchors in damp environments;
- anchors in marine and industrial environments;
- overhead crane and tram rails;
- industrial motors;
- aerials and signs;
- pylons;
- safety barriers;
- highway guard-rails.

TECHNICAL CHARACTERISTICS

Mapefix EP 470 Seismic is a two-component chemical anchoring product supplied in 470 ml bi-axial cartridges with 2 separate compartments containing component A (resin) and component B (catalyst), pre-dosed with the correct mixing ratio of 2:1 in volume (2 parts in volume of resin to 1 part in volume of catalyst). The 2 components are mixed together when they are extruded via the static mixer supplied with the cartridge. The mixer is screwed to the end of the cartridge and no preliminary mixing of the 2 components is required.
The 470 ml cartridge may be used by inserting it into a special extrusion gun for bi-axial cartridges.
If only part of the cartridge is used, the remaining product may be used, even after a number of days, by replacing the original static mixer blocked by hardened resin with a clean, new one.
Mapefix EP 470 Seismic hardly shrinks when it sets which makes it ideal, therefore, for filling large gaps and for circular crowns.
Mapefix EP 470 Seismic is compatible with a large number of building materials, such as:
- concrete in tension and compression zones;
- lightweight concrete;

Mapefix EP 470 Seismic

- cellular concrete;
- elements made from calcium silicate;
- masonry, stone, rock and bricks;
- solid and perforated substrates;
- wood;
- stone.

Mapefix EP 470 Seismic is certified according to European standards ETA option 1 (anchors in concrete in tension or compression zones), ETA option REBAR (anchors for supplementary reinforcement) and ETA C2 seismic performance (anchors in seismic zones).

RECOMMENDATIONS

Do not apply on dusty or crumbling surfaces.
Do not use on surfaces with traces of oil, grease and form-release compound, adhesion may be compromised or reduced.
Do not apply if the air temperature or temperature of the substrate is lower than +5°C.
Do not apply loads until it has completely hardened (T_{cure}) (see table 1).

APPLICATION PROCEDURE

Anchor design

The size of the hole in the substrate, the depth of the anchor, the diameter of the metal bar and the maximum permitted loads must be calculated by a qualified design engineer. The following tables contain practical design suggestions based on the company's experience and on internal testing carried out in compliance with EOTA guidelines (European Organization for Technical Assessment). MAPEI also has a dedicated programme available (**Mapefix Software Design**) to help designers and technicians find the correct size for single and multiple anchors in any concrete element.

Preparation of solid substrates

Make holes in the substrate with a drill or hammer drill, depending on the type of material to be drilled and the depth of hole required.
Remove all traces of dust and loose material from inside the holes with compressed air.
It is very important that holes are carefully cleaned in order for **Mapefix** to reach the maximum mechanical performance possible.
Clean the surface inside the holes with a long-bristled bottlebrush.
Remove all traces of dust and loose material again from inside the holes with compressed air.
If possible remove any standing water from inside the holes; this will also help reduce the reaction time of the **Mapefix EP 470 Seismic** epoxy resin.

Preparation of the metal bar

Clean and degrease the metal bar before anchoring it in the substrate. Remove all traces of rust and form-release compound.

Preparation of the resin for the chemical anchor

Unscrew the cap and screw the static mixer to the end of the cartridge.
Insert the cartridge in the extrusion gun.
Discard the first 3 shots of resin; they may not be mixed correctly.
Starting from the bottom of the hole, extrude the product in the hole until it is full.
Insert the metal bar in the hole using a rotary movement to expel all the air until the excess resin comes out of the hole. The metal bar must be inserted in the hole within the start setting time (T_{gel}). Only apply loads to the bar once the resin has completely hardened (T_{cure}), as indicated in table 1.

CONSUMPTION

According to the size of hole or gap to be filled (see tables 8 and 9).

Cleaning

Use normal solvent-based paint thinners to clean all work tools and equipment.

PACKAGING

Boxes of twelve 470 ml cartridges with 12 static mixers.

COLOURS AVAILABLE

Grey.

STORAGE

24 months in its original packaging at a temperature of +5°C to +25°C.

SAFETY INSTRUCTIONS FOR PREPARATION AND APPLICATION

Mapefix EP 470 Seismic component A is irritant for the eyes and skin. Both component A and B may cause sensitization if they come in contact with the skin of predisposed subjects. **Mapefix EP 470 Seismic** component B is corrosive and it may cause burns; furthermore it is dangerous if inhaled or swallowed. The product contains low weight molecular epoxy resins which may cause sensitization if cross-contamination with other epoxy compounds occurs. During use, wear protective gloves and goggles and take the usual precautions for handling chemicals. If the product comes in contact with the eyes or skin, wash immediately with plenty of clean water and seek medical attention. It is recommended to work in well-ventilated areas. In case of poor ventilation, it is recommended to wear a mask with filters. Furthermore, **Mapefix EP 470 Seismic** component A is dangerous for aquatic life. Do not dispose of it in the environment. For further and complete information about the safe use of our product please refer to the latest version of our Material Safety Data Sheet.

PRODUCT FOR PROFESSIONAL USE.

WARNING

Although the technical details and recommendations contained in this product data sheet correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical application; for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application. In every case, the user alone is fully responsible for any consequences deriving from the use of the product.

Please refer to the current version of the Technical Data Sheet, available from our website www.mapei.com

All relevant references for the product are available upon request and from www.mapei.com

TECHNICAL DATA (typical values)	
PRODUCT IDENTITY	
Consistency:	thixotropic paste
Colour:	light grey
Density (g/cm^3):	1.41
APPLICATION DATA (at +23°C and 50% R.H.)	
Application temperature range:	from +5°C to +40°C
Start setting time (T_{gel}):	see table 1
Final hardening time (T_{cure}):	see table 1
PERFORMANCE CHARACTERISTICS	
Compressive strength (EN ISO 604) (N/mm^2):	80
Flexural strength (EN ISO 178) (N/mm^2):	58
Modulus of elasticity (EN ISO 604) (N/mm^2):	8624
Resistance to UV rays:	good
Chemical resistance:	excellent
Resistance to water (EN 12390-8):	excellent
In-service temperature range:	from -40°C to +72°C
Electrical resistivity (IEC 93):	1.2x10^{12} Ω m
Thermal conductivity (IEC 60093):	0.47 W/m·k
Size of anchor:	see tables 2 and 3
Recommended loads:	see tables 6 and 7
Consumption:	see tables 8 and 9

Reaction time of product		
Temperature of substrate (0)	**Start setting time (T_{gel})**	**Final hardening time (T_{cure})**
		dry, damp or wet substrate
°C	minutes/hours	hours
0	3 h 20’	54 h
+5	2 h 30’	41 h
+10	1 h 40’	28 h
+20	50’	16 h
+30	20’	12 h

Table 1

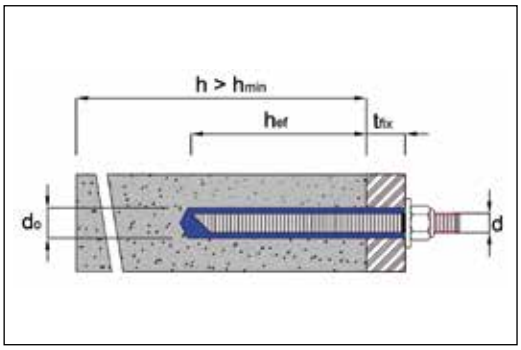
(0) minimum temperature of product +5°C

Installation parameters for threaded bar												
Threaded bar				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Diameter of threaded bar	d		mm	8	10	12	16	20	24	27	30
Diameter of hole in concrete	d_0		mm	10	12	14	18	24	28	30	35
Minimum distance from edge	c_{min}		mm	40	50	60	80	100	120	135	150
Minimum pitch between bars	s_{min}		mm	40	50	60	80	100	120	135	150
Minimum and maximum anchoring depth of threaded bar	h_{ef}	$h_{ef,\,min}$	mm	60	60	70	80	90	96	110	120
		$h_{ef,max}$	mm	160	200	240	320	400	480	540	600
Minimum thickness of concrete element	h_{min}		mm	h_{ef} + 30 mm (≥ 100 mm)			h_{ef} + 2 d_0				
Required tightening torque	T_{inst}		Nm	10	20	40	80	130	200	270	300

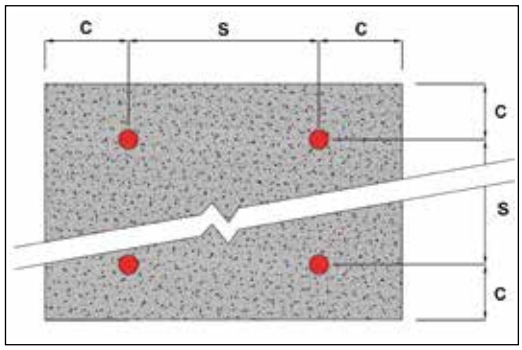
Table 2

Installation parameters for reinforcing bars											
Reinforcing bar			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Diameter of reinforcing bar	d	mm	8	10	12	14	16	20	25	28	32
Diameter of hole in concrete	d_0	mm	12	14	16	18	20	25	30	35	40
Minimum distance from edge	c_{min}	mm	40	45	55	63	70	85	105	135	150
Minimum pitch between bars	s_{min}	mm	40	45	55	63	70	85	105	135	150
Anchoring depth of reinforcing bar	h_{ef}	mm	80	90	110	125	140	170	210	270	300
Minimum thickness of concrete element	h_{min}	mm	110	120	142	161	180	220	270	340	380

Table 3



Drawing 4



Drawing 5

Recommended TENSILE and SHEAR loads (1) for a single anchor in a rough hole (2)

	In-service temperature (3)				M8	M10	M12	M16	M20	M24	M27	M30
Tensile load	24°C/40°C	Non-cracked	$N_{Rec, stat}$	kN	9.0	14.3	20.8	33.6	49.4	73.1	89.4	106.6
		Cracked	$N_{Rec, stat}$				15.6	20.5	38.0	52.1		
		Seismic C2	$N_{Rec, stat}$					8.7	14.2	19.6		
	50°C/80°C	Non-cracked	$N_{Rec, stat}$		8.6	11.3	16.6	26.3	37.3	68.0	86.8	100.7
		Cracked	$N_{Rec, stat}$				11.8	15.5	28.9	43.8		
		Seismic C2	$N_{Rec, stat}$					6.6	10.7	15.1		
Shear load without bending moment		Non-cracked	$V_{Rec, stat}$	kN	5.4	8.6	12.5	23.3	36.2	52.5	68.2	83.4
		Cracked	$V_{Rec, stat}$				12.5	23.3	36.2	52.5		
		Seismic C2	$V_{Rec, stat}$					14.3	21.8	30.8		
Anchoring depth of threaded bar			h_{ef}	mm	80	90	110	125	170	210	240	270
Distance from edge			$c_{cr,N}$	mm	101	121	145	188	231	277	312	346
Pitch between bars			$s_{cr,N}$	mm	$2 \times C_{cr,N}$							

Table 6

(1) recommended load valid for the following conditions:
- class 5.8 steel bar
- shear load without bending moment
- concrete minimum class C20/25
- $C \geq C_{cr,N}$
- $S \geq S_{cr,N}$
- $h \geq 2 \times h_{ef}$
- includes safety factors
- for different design conditions use Mapefix Software Design, developed in compliance with current European standards

(2) rough holes made with hammer drill
(3) constant in-service temperature/maximum peak temperature

Recommended TENSILE and SHEAR loads (1) for a single anchor in a rough hole (2)

	In-service temperature (3)				Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Tensile load	50°C/80°C	Non-cracked	N_{Rec}	kN	9.4	13.3	19.5	25.5	26.9	39.6	58.9	77.6	86.2
Shear load without bending moment		Cracked	V_{Rec}	kN	7.7	12.1	17.4	23.7	31.0	48.4	75.7	95.0	124.0
Anchoring depth of reinforcing bar			h_{ef}	mm	80	90	110	125	140	170	210	270	300
Distance from edge			$c_{cr,N}$	mm	80	90	110	125	140	170	210	270	300
Pitch between bars			$s_{cr,N}$	mm	$2 \times C_{cr,N}$								

Table 7 ***not ETA certified***

(1) recommended load valid for the following conditions:
- class FE B44k steel bar
- concrete minimum class C20/25
- $C \geq C_{cr,N}$
- $S \geq S_{cr,N}$
- $h \geq 2 \times h_{ef}$
- includes safety factors
- for different design conditions use Mapefix Software Design, developed in compliance with current European standards

(2) rough holes made with hammer drill
(3) constant in-service temperature/maximum peak temperature

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Consumption of Mapefix EP 470 Seismic										
			M8	M10	M12	M16	M20	M24	M27	M30
Diameter of threaded bar	d	mm	8	10	12	16	20	24	27	30
Diameter of hole in concrete	d_0	mm	10	12	14	18	24	28	30	35
Anchoring depth	h_{ef}	mm	80	90	110	125	170	210	240	270
Theoretical consumption per hole		ml	3	4	5	8	28	41	39	83
Number of holes per 470 ml cartrdige		n°	173	126	87	59	17	11	12	6

Table 8

Consumption of Mapefix EP 470 Seismic										
			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Diameter of reinforcing bar	d	mm	8	10	12	14	16	20	25	28	32
Diameter of hole in concrete	d_0	mm	12	14	16	18	20	25	30	35	40
Anchoring depth	h_{ef}	mm	80	90	110	125	140	170	210	270	300
Theoretical consumption per hole		ml	6	8	12	15	19	36	54	112	163
Number of holes per 470 ml cartrdige		n°	78	58	40	31	25	13	9	4	3

Table 9

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